MARITIME TECHNOLOGY COOPERATION CENTRE CARIBBEAN (MTCC Caribbean)

CAPACITY BUILDING FOR CLIMATE MITIGATION IN THE MARITIME SHIPPING INDUSTRY
THE GLOBAL MTCC NETWORK (GMN) PROJECT

MTCC Caribbean’s Pilot Project Report 2: Data Collection on Ships’ Fuel Consumption

This project is financed by the European Union and implemented by the International Maritime Organization

THE UNIVERSITY OF TRINIDAD AND TOBAGO

The MTCC Caribbean is hosted by the University of Trinidad and Tobago

This document was produced by the MTCC-Caribbean for review by the IMO. It was prepared by MTCC-Caribbean as a contractor to the IMO for the Capacity Building for Climate Mitigation in the Maritime Industry Project
Acknowledgements

This document was produced with the financial assistance of the European Union. The contents of this publication are the sole responsibility of UTT and can in no way be taken to reflect the views of the European Union and the International Maritime Organization (IMO).

Preparation of MTCC Caribbean’s Pilot Project Report 2: Data Collection on Ships’ Fuel Consumption was coordinated by Captain Sukhjit Singh, Ms. Suzette Balkaran and Mr. Tevin Parris. Contributors were Captain Sukhjit Singh Mr. Stephan Nanan, Ms. Suzette Balkaran and Mr. Michael Razack.

This document was edited by Mrs. Vivian Rambarath-Parasram. The comments and input provided by Ms. Sarita Mahabir-Lee is gratefully acknowledged. Thanks are also due to the Project Coordinating Unit (PCU) for the Global MTCC Network (GMN) of the IMO for reviewing the document in full.

Unless otherwise stated the information in this document is protected under international copyright laws. The document includes texts, images, logos, methodologies, formulae and technical know-how and is the Intellectual Property of The University of Trinidad and Tobago. Nothing contained herein shall be construed to grant the Receiving Party any license under any intellectual property right of UTT.

This document shall not be redistributed, modified, displayed, published or reproduced in whole or in part-without the written permission of UTT. The IMO and the European Union have the right to use free of charge any results of the Project, including the reports and other documents relating to it, which are subject to industrial or intellectual property rights. Any use made of this document must be for non-commercial research purposes or private study purposes only.

Contents

1 Introduction ........................................................................................................................................... 5

2 Overview ............................................................................................................................................... 8

  2.1 Scope of the Pilot Projects ........................................................................................................... 9
    2.1.1 Pilot Project 2 – Data Collection on Ships Fuel Consumption ......................................10

3 Methodology for voluntary fuel oil consumption data collection under Pilot Project 2 ........12

  3.1 Top-Down Method – Data on shipping activity using AIS (IHS) and using models for energy consumption in the absence of data from AIS ............................................................14
  3.2 Bottom-Up Method 1 ................................................................................................................14
  3.3 Bottom-Up Method 2 ................................................................................................................17

4 Limitations and challenges ........................................................................................................... 18

5 Detailed description of the activity .............................................................................................. 18

  5.1 Use of Ship Simulators ...............................................................................................................20
  5.2 Stakeholder engagement ............................................................................................................21

6 MTCC Caribbean’s Data Collection ........................................................................................... 23

  6.1 Voluntary Reporting Data Collection Form ............................................................................23
    6.1.1 Single Electronic Window (SEW) ..................................................................................24
    6.1.2 Data via Maritime Administrations/EE Focal Points .......................................................24
    6.1.3 Direct Reporting to MTCC Caribbean ..........................................................................25
    6.1.4 Data from IHS Markit ........................................................................................................25

  6.2 Visibility Activities of the Pilot Projects ....................................................................................25
    6.2.1 Caribbean Shipping Association (CSA) - 48th Annual General Meeting and Exhibition ..........................................................26
    6.2.2 Attendance of MTCC Caribbean Team Members at Various International Maritime Conferences ..........................................................................................................................27
    6.2.3 Submission of Proposal to Caribbean Memorandum on Port State Control ...............28
    6.2.4 Dissemination of information on Pilot Projects ...............................................................28

7 Results ............................................................................................................................................... 30

  7.1 Analysis of EEOI data collected with the use of MTCC Caribbean’s Data Collection Form 30
    7.1.1 Calculation of GHG Emissions ..........................................................................................31
    7.1.2 Calculation of EEOI – MTCC Caribbean’s Data Collection Form ..................................32

  7.2 Analysis of EEOI data collected with the use of IHS database and AIS Live ......................43
    7.2.1 Calculation of GHG Emissions ..........................................................................................44
7.2.2 Calculation of EEOI - HIS Fairplay ................................................................. 45
7.3 Pilot project 2 - Pilot-Scale Voluntary Data Collection and Reporting Systems .... 55
8 Data Analysis & Discussions .............................................................................. 58
8.1 EEOI Baseline calculations ............................................................................ 58
9 Conclusions ...................................................................................................... 60
Appendices ............................................................................................................. 62
Appendix I – Shipping Notice Issued by Maritime Services Division Trinidad and Tobago in support of MTCC Caribbean data reporting system ........................................................................... 62
Appendix II – Pictures from the Stakeholder Workshop ........................................ 64
Appendix III – Sample of Record of meeting with Shipping Agents ...................... 67
Appendix IV – Data Collection form & Guidance Document .................................. 69
Appendix V – MTCC Caribbean Information notice 001 of 2018 .......................... 73
Appendix VI – MTCC Caribbean’s presentation on the development and use of its Online Voluntary Reporting System and Web Portal .......................................................... 76
Appendix VII – MTCC Caribbean Pilot project feature in the official Journal of Caribbean Shipping Association .......................................................... 77
Appendix VIII – MTCC Caribbean Proposal to CMoU .......................................... 79
Appendix IX – Samples of MTCC Caribbean’s communication and visibility activities in relation to the pilot projects .......................................................... 81
1 Introduction

The Caribbean region is located at the intersection of major East-West and North-South global trading routes. Fifteen percent of containerized global merchandise trade passes through the Caribbean by virtue of its proximity to the Panama Canal and the major markets of the east coast of North and South America. Due to its heavy maritime traffic, sensitive and fragile marine ecosystem, and the nature of the currents through the region, the Caribbean Sea was designated a Special Area with restrictions under MARPOL Annex V in 2011. However, with increased maritime traffic, there is a corresponding impact on air quality that may become detrimental to the region.

There are approximately 4202 vessels within the Caribbean area at any given instant. Of this number, 2804 are pleasure crafts. The remaining 1398 vessels are comprised of commercial vessels including fishing vessels, with 833 vessels greater than 400 GT and 567 vessels greater than 5000 GT. Those over 5000 GT were identified as the main contributors and were targeted for the purpose of data collection.

![Maritime traffic footprint of Caribbean Sea](marinevesseltraffic.com)

*Figure 1: Maritime traffic footprint of Caribbean Sea (approx. 1400 commercial vessels at any given instant) (Source: marinevesseltraffic.com, 2019)*
MTCC Caribbean’s Pilot Projects were phased over three (3) years and focused on the uptake of energy efficiency in shipping and data collection associated with air emissions due to commercial shipping from the 16 territories under the purview of MTCC Caribbean (Table 1).

<table>
<thead>
<tr>
<th>Antigua and Barbuda</th>
<th>Grenada</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bahamas</td>
<td>Guyana</td>
</tr>
<tr>
<td>Barbados</td>
<td>Haiti</td>
</tr>
<tr>
<td>Belize</td>
<td>St Kitts &amp; Nevis</td>
</tr>
<tr>
<td>Cuba</td>
<td>St Vincent &amp; the Grenadines</td>
</tr>
<tr>
<td>Dominica</td>
<td>Suriname</td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>Trinidad and Tobago</td>
</tr>
<tr>
<td>St Lucia</td>
<td>Jamaica</td>
</tr>
</tbody>
</table>

Table 1: Target Countries for MTCC Caribbean’s Pilot Projects

The Implementation of MTCC Caribbean’s Pilot Projects included:

- Data capture, Information sharing and dissemination;
- Monitoring Annex VI compliance for the vessels trading in the region through partnerships with Ports, Maritime administrations and Pilots’ associations;
- Mapping the use of existing energy efficient technology by collecting data from vessels trading in the region;
- Promoting technology transfer and best practices to other Caribbean territories through capacity building initiatives; and
- Informing the Maritime sector in the region of the development of new standards, guidelines and best practices in GHG and energy efficiency on ships.

Consequently, in compliance with the Pilot Project 2 proposal, the following outcomes were achieved:

1. Relationships were established with key maritime stakeholders;
2. 15 Energy Efficiency Focal Points established within respective regional maritime administrations;
3. Direct Reporting from EE Focal Points, Ports and Major shipping lines within the region;
4. Participation of 27 shipping agencies and 22 shipping lines in the data collection process;
5. MTCC Caribbean’s Online Voluntary Reporting System (OVRS) was developed and launched;
6. Data was collected via the use of the established OVRS, Direct reporting from EE Focal Points, Direct Reporting from Vessels and IHS Fairplay Database;
7. Capture of 21116 port calls amounting to 50% ships calling at ports within the region;
8. Capacity building workshops were conducted to increase awareness of the reporting requirements as guided by the IMO; and
9. Pilot Project Report 2 was completed and submitted to IMO.

All outcomes, of Pilot Project 2, were therefore achieved.
The objective of pilot project 2 was to establish a fuel consumption data collection system from the vessels calling at ports within the Caribbean region. Three methods, Top-Down, Bottom-Up Method One and Bottom-Up Method Two, are used for calculating/estimating ship’s fuel consumption and emissions (IMO 2014). These methods have been used by the IMO GHG studies and are further discussed in section 3.1 – 3.3 of this report. MTCC Caribbean utilized Bottom-Up Method One and Two in executing this pilot project.

The single electronic windows (SEW) and the establishment of Energy Efficiency Focal Points (EEFP) in each reporting maritime administration facilitated the use of MTCC Caribbean’s Data Collection Form for the collection of data and subsequent analysis using Bottom-Up method one. Use of SEWs and EEFP facilitated the creation of the Online Voluntary Reporting System (OVRS) which targeted a minimum of 20% traffic in the region for the first year (2017) of the project.

MTCC Caribbean had also targeted to have 50% of the ships trading in the Caribbean report using the OVRS by March 2019. However, given the challenges experienced by various Caribbean territories in the implementation of the OVRS, Bottom-Up method two was implemented to capture data from 50% of the ship calling at Caribbean ports within the scope of the project. Collection of data is continuing with due regard to contemporary reporting requirements of the International Maritime Organization (IMO). As a first step in achieving efficient use of fuel, MTCC Caribbean embarked on capacity building activities that targeted the reporting of fuel consumption and calculations of emissions from ships.

These pilot projects facilitated the creation of the first baseline data for the region on the use of energy efficient technology, fuel consumption (type and quantity) and GHG emissions by merchant vessels. When published, these baselines will provide regional stakeholders with data to make informed decisions towards investment in energy efficient technology, emissions abatement and control methods. During this project maritime administrations reported their state of readiness for the implementation of and compliance with MARPOL Annex VI, Chapter 4, Reg. 22A. It can be used to formulate strategies for more effective ocean governance through ratification, promotion of technology transfer and awareness. Mandatory ship fuel oil consumption data collection under Reg. 22A of MARPOL Annex VI should provide the basis for an objective, transparent and inclusive policy debate as required by the International Maritime Organization (IMO).
2. Overview

According to the estimates presented in the *Third IMO GHG Study 2014*, international shipping emitted 796 million tonnes of CO₂ in 2012, which accounted for about 2.2% of the total emission volume for that year. This percentage is of greater significance when considering that shipping is the principal carrier of world trade, providing a vital service to global economic development and prosperity. The Third IMO GHG Study also estimated that, in a business as usual (BAU) scenario, CO₂ emissions from international shipping could grow by between 50% and 250% by 2050, depending on future economic growth and energy developments. Poor air quality due to international shipping accounts for approximately 400,000 premature deaths per year worldwide, at an annual cost to society of more than €58 billion according to recent scientific studies. However, The Second IMO GHG Study noted that “a significant potential for reduction of GHG emissions through technical and operational measures has been identified. Together, if implemented, these measures could increase efficiency and reduce the emissions rate by 25% to 75% below the current levels”.

Discussions at the MEPC’s 62nd session held from the 11th - 15th July 2011 demonstrated a shift in approach at the IMO, leading to strategies for GHG emission reductions. Deliberations from the United Nations Framework Convention on Climate Change (UNFCCC) influenced the IMO discussions on GHG emissions. In 2011, the IMO adopted a collection of technical and operational measures which together provide an energy efficiency framework for ships. These amendments to the International Convention for the Prevention of Pollution from Ships (MARPOL) were adopted in July of the same year. Chapter 4 was added, to MARPOL Annex VI, outlining Regulations on energy efficiency for ships and making mandatory the Energy Efficiency Design Index (EEDI) for new ships, and the Ship Energy Efficiency Management Plan (SEEMP) for all ships. All ships of 400 GT and above, engaged in international trade, are required to implement and maintain a Ship Energy Efficiency Management Plan (SEEMP) that establishes a mechanism for operators to improve the energy efficiency of ships. This should be achieved by monitoring the energy efficiency performance of a ship’s transportation work, using, for example, the Energy Efficiency Operational Indicator (EEOI) as a monitoring / benchmarking tool and, at regular intervals, considering new technologies and practices to improve energy efficiency.

This framework was the first legally binding instrument to be adopted since the Kyoto Protocol that addresses GHG emissions and the first global mandatory GHG-reduction regime for an international industry sector. Regulation 23 of MARPOL Annex VI also encourages the promotion of technical cooperation and transfer of technology relating to the improvement of energy efficiency of ships between States.

In this regards, along with assisting in the efforts to promote low-carbon technologies by facilitating public-private partnerships and information exchange, the IMO continues to provide mechanisms for facilitating information sharing, technology transfer, capacity-building and

---

technical cooperation. As highlighted in the IMO’s 2nd GHG study, ships’ energy consumption and CO₂ emissions could be reduced by up to 75% by applying operational measures and implementing existing technologies. Many of these measures are cost-effective and offer net benefits, as a reduction in fuel costs ensures the recovery of any operational or investment costs. Further reductions could be achieved by implementing new innovative technologies. Guided by the IMO’s work, the ideas for the Pilot Projects were born out of Regulation 23 of MARPOL Annex VI as there was an emphasis on the integration of technology transfer at a global level. The following existing guidance from the IMO was utilized in the development of the pilot projects:

- The Energy Efficiency Operational Indicator (EEOI) as a Key Performance Indicator (KPI) to measure the efficiency in the industry, followed by the Ship Energy Efficiency Management Plan (SEEMP) and then the Data Collection System (DCS);
- Resolution MEPC.229(65) (Adopted 17th May 2013), Promotion of technical co-operation and transfer of technology relating to the improvement of energy efficiency of ships;
- Regulation 23 MARPOL Annex VI, Promotion of technical cooperation and transfer of technology relating to the improvement of energy efficiency of ships;
- EEOI – MEPC.1/Circ.684 (17th August 2009), Guidelines for voluntary use of the ships Energy Efficiency Operational Indicator (EEOI);
- SEEMP – Resolution MEPC.282(70) (Adopted 28th October 2016), Guidelines for the development of a Ship Energy Efficiency Management Plan (SEEMP); and

2.1 Scope of the Pilot Projects

In line with the GMN project’s aim, MTCC Caribbean’s pilot projects include the verification of energy efficient operations and the establishment of Energy Efficiency baseline data for ships operating within the Caribbean region. The GMN project identified the need for two Pilot Projects from the MTCCs. Their pilots were required to:

1. Promote the uptake of low-carbon technologies and operations in maritime transport through the implementation of technology-related pilot projects, thus creating an enabling environment for energy-efficient practices within the shipping sector; and
2. Establish pilot scale voluntary data collection and reporting systems to support ship-owners and maritime administrations and feed the experience and understanding of these systems into debates and decision-making processes at the IMO.

However, in the absence of any baseline data on the use of existing technology on-board vessels in the region, it was difficult to identify potentially applicable technologies. In the absence of this data, one of the major tasks was to establish such a baseline. The facilitation of technology transfer was promoted in the form of various technology providers applicable to the type of ships operating within the region, presenting during capacity building workshops.

Figure 2 identifies the two pilot projects implemented by MTCC Caribbean and their respective objectives for the purpose of the project.
2.1.1 Pilot Project 2 – Data Collection on Ships Fuel Consumption

The objective of this pilot project was to establish a fuel consumption data collection system for the region. This pilot project provided the baseline of type of fuel consumption for ships trading in the Caribbean region. It also aided the regional flag states in the development of reporting lines as required by IMO regulations. However, it is worth noting that the methods and processes used for this pilot project did not intend to fulfill the requirements of regulation 22A of MARPOL Annex VI, for collection and reporting of ship fuel oil consumption data and therefore differed from these requirements.

Recording this data allowed vessels to be tracked through the region providing data on fuel consumption between ports, the type of fuel used, and ship speed between ports. This task was completed by identifying the equipment and machinery, inclusive of main propulsion engines, electrical generators prime movers, and boilers on-board each vessel, as well as recording the fuel type(s) and the amount of fuel at each port the vessel berths at whilst in the region. Ideally,
the information and data collected helped in the development of a simple tool required to measure a ship’s overall efficiency and performance.

Figure 3 identifies the geographical scope for MTCC Caribbean’s pilot project 2.

Figure 3: Geographical Scope of the Pilot Project 2
## 3 Methodology for voluntary fuel oil consumption data collection under Pilot Project 2

To achieve the outcomes of the pilot project, objectives were achieved via set of tasks planned over the duration the project as summarized in table 2.

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Task</th>
<th>Proposed Activities</th>
<th>Implemented Activities</th>
<th>Expected Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. Forging relationships with regional maritime administrations, Regional ports, Shipping Agents and Shipping companies.</td>
<td>Establish relationships with regional maritime administrations, Regional ports, Shipping Agents and Shipping companies. Synergise the reporting of data via existing channels.</td>
<td>Established an EE focal point in each Maritime Administration, engaged with Shipping agents, Shipping Companies and Operators, and Port Authorities. The existing reporting mechanisms were determined for each respective territory. Data collection processes were aligned to the existing reporting mechanisms.</td>
<td>To create relationships with key maritime stakeholders and synergise the reporting of data via existing channels. To develop MTCC e-portal reporting system.</td>
</tr>
<tr>
<td></td>
<td>2. Establish the reporting system using TTMPSA app and synchronize the reporting system with MTCC e-portal</td>
<td>Establish an online reporting system. Develop a Data Collection Form which would be compatible with the online reporting system. The Data Collection Form should be in such a format which could be easily disseminated to stakeholders, and returned to MTCC Caribbean.</td>
<td>The MTCC Data Collection Form was electronically developed in Excel format, with the ability to be saved and sent via .xlsx or .xml format. The Online Voluntary Reporting System (OVRS) was created and launched. The MTCC Caribbean Data Collection Form was sent to EE Focal Points, shipping agents, shipping companies and operators and port authorities. A pilot on reporting system using Single Entry Window was established and reporting commenced on 01st June 2017. The reporting of data was channelled through existing mechanisms within each reporting territory.</td>
<td></td>
</tr>
<tr>
<td>Collect data using established data collection system</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Collection of data from ships through established reporting system targeting minimum of 20% traffic in the region.</td>
<td>Target at least 20% of ships within the region for data collection through established reporting system, starting with ports in Trinidad and Tobago.</td>
<td>Collection of Data in Trinidad and Tobago using the Single Entry Window (reporting commenced on 01st June 2017). At least 20% of ships trading in the region was covered as data collection continued in 2018.</td>
<td>To capture data from vessels trading within the Caribbean Region. To increase awareness of the reporting requirement as guided by IMO.</td>
<td></td>
</tr>
<tr>
<td>2. Continue collection of data and with increased awareness on the reporting requirements. Establish the reporting lines as guided by the IMO requirements.</td>
<td>Create Data Collection Form as per IMO Guidelines. Build capacity within Maritime Administrations to establish reporting lines as guided by the IMO requirements.</td>
<td>The Data collection form was developed under the Energy Efficiency Guidelines for ships in MARPOL Annex VI and aligned with the subsequent MEPC Circulars and resolutions. Data collection form requested information on fuel consumption as guided by IMO requirements. MTCC also issued an informational notice (Appendix V) which explained the requirements and differences between IMO mandatory DCS and MTCC OVRS. Capacity building workshops were carried out.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Collection of data from ships through established reporting system targeting minimum of 50% traffic.</td>
<td>Target participation of at least 50% ships trading within region.</td>
<td>Collection of data via the use of the established OVRS, Reporting from EE Focal Points, Direct Reporting from Vessels and IHS Fairplay Database to cover at least 50% ships trading within the region. Database form IHS and AIS live was utilised using Bottom up method 2 to achieve the targeted 50% of ships calling at ports within Caribbean. This change in data collection was carried out to overcome the challenges in voluntary reporting system.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Communicate collected data</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Compilation and analysis of collected data</td>
</tr>
<tr>
<td>2. Communicating compiled data to IMO</td>
</tr>
</tbody>
</table>

**Table 2: Task Associated with Pilot Project 2**
The following recommendations from the IMO’s past GHG studies were considered while planning the Pilots:

- Direct vessel observations to the greatest extent possible
- Use of vessel specific activity and technical details in a bottom-up inventory model.

Bottom-up evaluation is a method for assessing emissions data using census information and emissions activity data combined with emission factors to generate independent estimates for comparison.

The emissions estimates generated using this methodology are very accurate if ships’ demographic and activity data are accurate. However, it requires extensive data, depends on the accuracy of emissions factors and activity data, and is time consuming.

Three methods for calculating/estimating ship’s fuel consumption and emissions can be used. They have been used by the IMO GHG studies. Each method has varying levels of complexity and reliability due mainly to the data collection methods used to enable calculation of fuel consumption and GHG emissions from ships. The methods are:

1. Top-Down Method – Marine fuel sales data/statics
2. Bottom-Up Method 1 – Data reported by ship owners/operators
3. Bottom-Up Method 2 – Data on shipping activity using AIS (IHS) and using models for energy consumption in the absence of data from AIS

For the purpose of pilot project 2, data was collected and analyzed using Bottom-Up Method 1 & Bottom-Up Method 2.

3.1 Top-Down Method – Data on shipping activity using AIS (IHS) and using models for energy consumption in the absence of data from AIS

To use this method, access to all national bunker fuel data over a period is needed. The emissions can then be calculated using internationally accepted emission factors highlighted in the third IMO GHG Study 2014. The method’s accuracy is dependent on the quality of the country’s bunker fuel data. Outputs from this method will provide an estimate of the emissions produced on a national basis. This method was not recommended as it has no direct alignment with the objectives of the pilot projects.

3.2 Bottom-Up Method 1

This method is based on activity reporting. This method requires the submission of fuel consumption data from individual ships under various conditions of voyage. In the MTCC Caribbean Pilot projects this method was adopted through the implementation of a data collection form that requires the direct reporting of static and dynamic data to the MTCC digital portal. Emissions are then derived by applying the appropriate emission factors. Given the extensive
shipping actors targeted to be involved in the data collection and reporting, there was difficulty in implementing the uniform data collection form in the region. The method was also limited to vessels calling at ports in the region and therefore was not able to capture the data for vessels transiting the region without calling at a port. The process for data reporting is illustrated in Figure 4 below.
Figure 4: MTCC Caribbean Data Collection Method
The details of each data collection stream are detailed in section 6. Upon receipt of data, the MTCC Technical officer verifies the various data inputs in the submitted xml file for validity before including it into the master data logger. The data logger was then analyzed by the technical team for findings and results.

3.3 Bottom-Up Method 2

Under this method, the primary source of vessel activity is accessed through AIS data which was acquired from a subscription to IHS Markit. The database provided ships’ key performance areas including a ship’s identity, position, speed and draught at a given time. Where there was an absence of AIS derived data, but data about the ship’s technical specifications were available, alternative methods that extrapolate estimates from third-party data were deployed to estimate ship-based activity and the associated energy consumption and emissions from ships. For this project, MTCC Caribbean has used this second bottom-up method to derive estimates of fuel consumption and emissions from data sources describing shipping activity and those describing ship technical characteristics.

This method was recommended to capture data for vessels calling at ports in countries not participating in the MTCC Caribbean voluntary data reporting system.
4 Limitations and challenges

In the absence of reported attained EEDI from the vessel calling at the Caribbean ports for Pilot Project 1; the scope was changed to calculate EEOI. The EEOI was calculated for each data set reported and compared with the EEDI. EEOI was compared with DWT and reported in Pilot Project 2.

The initial data gathering started using Bottom up method 1; however, only 6 reports were received daily against 76 daily average port calls by vessels in six maritime administrations currently participating in MTCC Caribbean’s voluntary reporting. The main challenges that contributed to this low participation rate were:

- The absence of any regional reporting requirements;
- Differing levels of technology in trade facilitation and monitoring and reporting for maritime traffic;
- The voluntary nature of the reporting form; and
- The absence of a motivating factor for participation

However, enhancing the data received directly from ships with Bottom Up method 2 utilizing the IHS database and AIS live allowed the capture of activity-based data, engine type, fuel consumption and fuel type for 20000 port calls between 2017 and 2019 amounting to 50% of the regional traffic.

5 Detailed description of the activity

A single user-friendly data collection form was developed to facilitate data collection for both pilot projects. The common data collection form facilitated the ease of participation for vessels and associated shipping agents. The use of a single unified document took into consideration the practical challenges of shipboard operations and was therefore expected to improve the rate of voluntary participation and implementation of the project. Data collection was initiated in Trinidad and Tobago after consultation with the Maritime Services Division (MSD) of the Ministry of Works and Transport. The form was integrated into Trinidad and Tobago’s Single-Entry Window (SEW) and improved based on feedback obtained at regular intervals. Data collection using MTCC Caribbean’s Data Collection form began on 1st June 2017. The shipping notice (Appendix I) issued by MSD facilitated the reporting through the creation of a maritime portal on the SEW hosted by the Ministry of Trade and Industry.

The successful implementation of the data collection mechanism required engagement with all relevant stakeholders. Energy Efficiency (EE) focal points were established with a view to enhancing the objectives of the project and pilots. Table 3 provides the details of the EE focal points established during the project. MTCC Caribbean hosted various EE focal point meetings using webinars and individual video conference calls to discuss and obtain feedback on:

- Identifying the current status of data collection within each territory’s ports;
- Discussing the existing system for dissemination and collection of information within ports;
- Identifying the medium through which data may be collected;
• The format in which data may be forwarded and shared with MTCC Caribbean; and
• Obtaining and actioning feedback from stakeholders within the territories with respect to data collection.

<table>
<thead>
<tr>
<th>#</th>
<th>Country</th>
<th>Maritime Administration</th>
<th>EE Focal Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Antigua and Barbuda</td>
<td>Antigua and Barbuda Department of Marine Services and Merchant Shipping</td>
<td>Mr. Wayne Mykoo</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:wmykoo@abregistry.ag">wmykoo@abregistry.ag</a></td>
</tr>
<tr>
<td>2</td>
<td>Bahamas</td>
<td>Bahamas Maritime Authority</td>
<td>Ms. Jade Evans</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:Jadeevans@bahamas.gov.bs">Jadeevans@bahamas.gov.bs</a></td>
</tr>
<tr>
<td>3</td>
<td>Barbados</td>
<td>Ministry of International Business &amp; Transport</td>
<td>Ms. Jacqueline Blackman</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:Sophia.Grimes@internationaltransport.gov.bb">Sophia.Grimes@internationaltransport.gov.bb</a></td>
</tr>
<tr>
<td>4</td>
<td>Belize</td>
<td>International Merchant Marine Registry of Belize (IMMARBE)</td>
<td>Ms. Darlin Tatianna Gaitan</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:dgaitan@portauthority.bz">dgaitan@portauthority.bz</a></td>
</tr>
<tr>
<td>5</td>
<td>Cuba</td>
<td>Cuban Maritime Safety Directorate</td>
<td>Mr. Jorge Ariel Tejeda Gonzalez</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:tejeda.sm@mitrans.gob.cu">tejeda.sm@mitrans.gob.cu</a></td>
</tr>
<tr>
<td>6</td>
<td>Dominica</td>
<td>Maritime Administration Department</td>
<td>Mr. Harold Guiste</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:guisteh@dominica.gov.dm">guisteh@dominica.gov.dm</a></td>
</tr>
<tr>
<td>7</td>
<td>Dominican Republic</td>
<td>Dominican Republic Coast Guard</td>
<td>Ms. Patricia Abreu</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:patricia.abreu@ambiente.gob.do">patricia.abreu@ambiente.gob.do</a></td>
</tr>
<tr>
<td>8</td>
<td>Grenada</td>
<td>Grenada Ports Authority</td>
<td>Mr. Ian Evans</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:portmanager@spiceisle.com">portmanager@spiceisle.com</a></td>
</tr>
<tr>
<td>9</td>
<td>Guyana</td>
<td>Maritime Administration Department (MARAD)</td>
<td>Mr. Romain Seurattan</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:romain.seurattan@gmail.com">romain.seurattan@gmail.com</a></td>
</tr>
<tr>
<td>10</td>
<td>Haiti</td>
<td>Service Maritime et de Navigation D’Haiti (SEMANAH)</td>
<td>Mr. Jean Getro Aime</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:gttrro@gmail.com">gttrro@gmail.com</a></td>
</tr>
<tr>
<td>11</td>
<td>Jamaica</td>
<td>Maritime Authority of Jamaica (MAJ)</td>
<td>Ms. Vannessia Stewart</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:vstewart@jamaicaships.com">vstewart@jamaicaships.com</a></td>
</tr>
<tr>
<td>12</td>
<td>St. Kitts and Nevis</td>
<td>St. Kitts &amp; Nevis International Ship Registry</td>
<td>Mr. Wayne Edmeade</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:waynejrsm@gmail.com">waynejrsm@gmail.com</a></td>
</tr>
<tr>
<td>13</td>
<td>St. Lucia</td>
<td>Saint Lucia Air And Sea Ports Authority (SLASPA)</td>
<td>Mr. Cassel Paul</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:cassel.paul@slaspa.com">cassel.paul@slaspa.com</a></td>
</tr>
<tr>
<td>14</td>
<td>St. Vincent &amp; the Grenadines</td>
<td>Division of Maritime Affairs</td>
<td>Ms. Jillianjoy Davis</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:registrar.svgmarad@gmail.com">registrar.svgmarad@gmail.com</a></td>
</tr>
<tr>
<td>15</td>
<td>Suriname</td>
<td>Maritime Authority of Suriname (MAS)</td>
<td>Mr. Raoel Coulor</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:rcoulor@mas.sr">rcoulor@mas.sr</a></td>
</tr>
<tr>
<td>16</td>
<td>Trinidad and Tobago</td>
<td>Maritime Services Division</td>
<td>Mr. Richmond Bassant</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:msdadminenviron@mowt.gov.tt">msdadminenviron@mowt.gov.tt</a></td>
</tr>
</tbody>
</table>

*Table 3: EE Focal Points of the Caribbean Region*
5.1 Use of Ship Simulators

The Full Mission Bridge and Engine Room Simulators of UTT’s Chaguaramas campus were used to simulate the selected conditions from the data gathered. This included the operation of Large Slow Speed Diesel Engines at different load conditions burning either Diesel Oil or Heavy Fuel Oil or a blend of the two fuels, and monitoring emissions levels including the calculation of EEOI at the different load conditions. The integration of Simulator exercises allowed the regional stakeholders to better appreciate the implementation of technological and operational methods for saving fuel and reducing associated emissions.

Picture 3: Simulation and Observation of Data in Engine Room Simulator

Picture 4: Representatives form Carnival Corporation and CMA CGM during Simulator exercise
5.2 Stakeholder engagement

Active and frequent engagement with relevant stakeholders was integral to the data collection process. Due to the level of interdependency between the stakeholders involved in maritime operations, successful implementation of data collection depended on the identification and understanding of different stakeholders, their practices, expectations and interests. It was determined within the early stages of the project that effective stakeholder engagement in this research and implementation was important for improving the quality and quantity of data reported. The purpose of MTCC Caribbean’s data collection system was specifically to:

- Facilitate the findings of the two pilot projects of the MTCC; and
- Create capacity within each administration to establish a reporting system.

Therefore, in this regard, the cooperation of all stakeholders within all territories in the region was crucial for ensuring that the objectives of all initiatives by the IMO including those of MTCC Caribbean are realized in the attempt to reduce the GHG emissions of the global maritime sector. Figure 5 below illustrates the key stakeholders involved in the data gathering.

![Stakeholders Involved in the Data Collection Process](image)

Figure 5: Stakeholders Involved in the Data Collection Process

A varied number of tools were employed for stakeholder engagement during the project duration. The importance of engaging a wide range of stakeholders in priority setting was often utilised. This process was critical for the success of the project as it not only conveyed the objectives of the project to stakeholders but also allowed the MTCC Caribbean team to better understand
obstacles to data collection. The impact of stakeholder engagement was evident in the form of increased reporting after every engagement activity. Figure 6 below illustrates the stakeholder engagement tools.

A Stakeholder Forum to discuss MTCC Caribbean’s Pilot Projects and Data Collection Process was held at the University of Trinidad and Tobago on the 31st October 2017, with the full support and endorsement of the Maritime Services Division (Appendix II). Several shipping agencies attended this event, and subsequently, one on one discussions were held at their offices. Additionally, MTCC Technical Officers made follow up telephone calls, and sent emails to shipping agents who did not participate in either the Stakeholder Forum or individual meetings, to discuss any issues which may have arisen when attempting to upload the Data Collection Form to TTBizlink. A sample meeting record with a shipping agent is attached in Appendix III. The following list comprises Shipping Agencies with whom MTCC Caribbean has had continuous engagement:

- A&R Shipping Ltd.
- Abraham Shipping Company Ltd.
- Agemar Trinidad Ltd.
- Amertrin Marine & Logistics Services Ltd.
- Caribbean Shipping Agencies Ltd.
- Central Navigation Ltd.
- Chan Kong Holdings Ltd.
- CMA CGM Trinidad Ltd.
- D. Hill Shipping Services Ltd.
- Elation Shipping Ltd.
- GAC Energy & Marine Services Ltd.
- Gordon, Grant & Co. Ltd.
- Gulf Shipping Ltd.
- Inchcape Shipping Services (T&T) Ltd.
- Inter-Continental Shipping Ltd.
- Jupiter Marine Services Ltd.
- Mariad Shipping & Services Ltd.
- Mediterranean Shipping Company (Trinidad & Tobago) Ltd.
- Norton Lilly (T&T) Ltd.
- Perez Y Cia (Trinidad) Ltd.
- Rican Shipping Ltd.
- Seaboard Marine (Trinidad) Ltd.
- Seaport Agencies Trinidad Ltd.
- Tropical Trinidad Agency Unlimited.
- Twin Island Shipping Agencies Ltd.
- United Shipping Agencies Ltd.
- World Trade Shipping Co.
These shipping agents represent/serve principals which include the major shipping lines, namely; MSC, CMA CGM, Golar LNG, Exmar, MSC Cruises, Columbia Shipmanagement Ltd., Gas Log LNG services Ltd., Mitsui OSK line, Oldendorff, BP Shipping Ltd., Tropical Shipping Ltd., NYK, Avance Gas Holdings Ltd, Maersk Line, ZIM, K – Line, Seaspan Shipmanagement (technical manager for CSCL), Hamburg Sud, Vega, Stena Bulk, Knutsen OAS Shipping and Seaboard Marine.

6 MTCC Caribbean’s Data Collection

6.1 Voluntary Reporting Data Collection Form

The objectives of MTCC Caribbean’s Pilots included the mapping of the existing technologies and best practices utilized on-board vessels trading in the Caribbean region. Therefore, data collected included the details on the use of equipment and machinery on-board including air emissions abatement and energy efficiency technologies being employed. In order to accomplish the objectives, the MTCC Caribbean Data Collection and Reporting System was established. In this regard, ships of 400 GT and above were required to submit data using MTCC Caribbean’s Reporting Form. Vessels smaller than 400 GT were also encouraged to participate in this reporting system. Data collection using MTCC Caribbean’s Data Collection form began 1st June 2017 in Trinidad and Tobago. The data collection form is attached in Appendix IV.

The reporting system provided the baseline of fuel consumption for ships trading in the Caribbean region. The participating ships were required to report their fuel oil consumption and voyage data at each port of call while operating in the region. The data requested under the MTCC Caribbean Data Collection and Reporting System was tailored to the needs of MTCC Caribbean’s pilot projects. Consequently, the MTCC Caribbean reporting requirement is more specific than that required for the IMO mandatory DCS. In order to differentiate the voluntary reporting for the purposes of the pilot projects, MTCC Caribbean issued Information Notice 001 of 2018 (Appendix V) for all regional stakeholders including but not limited to regional Maritime Administrations, Ship Agents, Operators, Owners, Ports and other regional maritime stakeholders.

The notice explained the requirements and differences between the IMO mandatory DCS and the MTCC Caribbean data collection system required for the purpose of the Global Maritime Technology Cooperation Centers Network (GMN) project. The notice emphasized that data requested by MTCC Caribbean is separate to IMO requirements and cooperation from all stakeholders is essential to achieve the objectives of MTCC Caribbean.

There were four data streams as at August 2019. The SEW (Single Electronic Window) continues to be the most effective method for data collection as it integrates the reporting with the pre-arrival notification. As for the other data streams, the Maritime Administrations/EE Focal Points remain the primary data sources, with direct reporting to MTCC Caribbean from ships steadily increasing. Collection of data from the online database provided by IHS Markit was the fourth method and supplemented the previous three methods by filling the gaps to allow the targeted number of vessels for the project to be reached. The number of data sets collected via each method is shown in Table 4 below:
6.1.1 Single Electronic Window (SEW)

The Data collection form is available to shipping agents/managers/operators/owners in Excel format on the TTBizLink website at (www.ttbizlink.gov.tt), via the e-Maritime Services Module. This module is aligned with the SEW method for the transmission of reporting from vessels arriving and operating within Trinidad and Tobago’s waters. The data submitted is uploaded, along with other required information, to the SEW. The MTCC Caribbean Team has access through TTBizLink to download and store the submitted forms. As all vessels calling to the ports are required to register and report for inward clearance, MTCC Caribbean can confirm the total number of ships calling to ports within Trinidad and Tobago as well as the total number of ships that are reporting. Antigua and Barbuda had reassured their intent to incorporate the MTCC Data Collection form into their SEW from November 2019. Figure 7 below shows a snapshot of the TTBizlink website/interface.

![TTBizLink Home page with link to MTCC reporting](image)

6.1.2 Data via Maritime Administrations/EE Focal Points

The EE Focal Points in The Bahamas, Belize, Guyana, St. Vincent & the Grenadines and Suriname, each submit data on a daily basis to MTCC Caribbean. Shipping agents or ships’ masters within their respective territories submit the filled-out forms directly to these EE focal points which are forwarded to a Technical Officer at MTCC Caribbean. In the case of the Bahamas, Freeport Harbor Company and Nassau Container Terminals, two private ports, collect the forms and submit through the EE Focal point for the Bahamas.
6.1.3 Direct Reporting to MTCC Caribbean

MTCC Caribbean has also encouraged shipping lines that have the technology required to report directly to MTCC Caribbean’s designated email ID. The forms are completed by the master and then emailed directly to MTCC Caribbean for collation. Caribbean Cruise Lines operated by Carnival Corporation currently reports directly to MTCC Caribbean.

6.1.4 Data from IHS Markit

In December 2018, MTCC Caribbean entered into a contract with IHS Markit for a yearly subscription to their database. This subscription currently supplements the existing data collection methods of MTCC Caribbean.

6.2 Visibility Activities of the Pilot Projects

A variety of activities were dedicated to promoting the visibility of the pilot projects. In addition to featuring articles on our Newsletters, information notices and presentations to key stakeholders, a Web portal was also developed for the dissemination of data and information to stakeholders in relation to pilot projects. The dashboard’s simple design allows the user to select between ship and country data. See Figures 8 and 9 for snapshots of this Dashboard.

The shipboard data presents ship specific data in two forms – Static, and Dynamic (voyage data). Static data presents the vessel particulars including details of the propulsion system, Electric power supply systems, Boilers, EE technology and abatement methods installed on board. Voyage data presents the fuel consumption (quantity and type) and representative sea conditions of the voyage.

Figure 8: Details of the Ship Data as Presented on the MTCC Portal
The portal also captures the country specific data for 16 territories covered under the geographical scope of the project. It provides the user with information on the various reporting mechanisms, status of MARPOL Annex VI, details of EEFP and port state control activities.

![Figure 9: Details of the Country Data as Presented on the MTCC Portal](image)

MTCC Caribbean provided updates on the development of this portal at its national workshops, and most recently its 2nd Regional Workshop held from July 1st – 3rd, 2019. Stakeholder feedback from the workshops was positive during the development of the reporting system. When asked about topics that were beneficial to them, some stakeholders cited the development of an EEOI baseline for the region, and the development of a regional voluntary reporting system. On topics that MTCC Caribbean should further delve into at future workshops, they indicated that they would like to learn more about fuel efficiency technology available within the region, among others. The web portal is being used to disseminate this information. UTT’s computer lab and library facilities were also used to familiarize and train stakeholders on the use of the portal on day 3 of the Workshop. Appendix VI provides an image of MTCC Caribbean’s presentation on the use of the portal at the workshop.

6.2.1 Caribbean Shipping Association (CSA) - 48th Annual General Meeting and Exhibition

MTCC Technical officer Ms. Suzette Balkaran delivered a presentation on MTCC Caribbean’s pilot projects and capacity building initiatives at the Caribbean Shipping Association’s (CSA) 48th Annual General Meeting and Exhibition held at the Riu Plaza Hotel, Panama from October 7th-10th 2018. MTCC Caribbean’s Data Collection Process was explained in detailed, with emphasis being placed on promoting the use of MTCC Caribbean’s Data Collection Form. The event was well attended by over 300 key maritime stakeholders, including port authorities, terminal operators, shipping agents, shipping lines, tug and salvage companies, consultants, freight forwarders, leasing companies and others. An update was given on the countries engaged in
MTCC Caribbean’s pilot projects, the use of the data collected to determine the energy efficient technology on board vessels, the types of fuel consumed, and the Energy Efficiency Operational Indicator of reporting vessels. Throughout the event, Ms. Balkaran held discussions with representatives of National Shipping Associations, Maritime Administrations and Shipping Lines to further elaborate on how MTCC Caribbean’s Data Collection process was successfully implemented in the countries which were reporting data. Pilot projects, associated challenges and mitigation strategies were also highlighted in the Official Journal of the Caribbean Shipping Association (http://www.caribbean-maritime.com/index.php/latest22/2018-10-03-10-12-13/505-mtcc-caribbean-maritime-technology-cooperation-centre-caribbean.html). The extract of the feature is attached in the Appendix VII.

6.2.2 Attendance of MTCC Caribbean Team Members at Various International Maritime Conferences

In support of these pilot projects, MTCC Caribbean team members attended and presented at various international maritime conferences globally and these include:

- Panama Maritime XIII World Conference and Exhibition, Panama City, Panama (13th – 15th March 2017);
- Environmental Sustainable Shipping Industry Conference (ESSIC), Panama City, Panama (14th March, 2017);
- MTCC Asia 1st Regional Workshop, Shanghai Maritime University (SMU), China (18th – 22nd September 2017);
- The Future Ready Shipping Conference, Grand Copthorne Waterfront Hotel, Singapore (25th – 26th September 2017);
- Development of Maritime Energy Efficiency & Emissions Strategies and their Implementation workshop, Global Maritime Energy Efficiency Partnerships (GloMEEP), Singapore (27th September 2017);
- The UN Climate Change Conference (Conference of the Parties 23), Bonn, Germany (6th – 7th November 2017);
- Clean Energy Conference, The Energy Chamber of Trinidad & Tobago, Arthur Lok Jack School of Business, Mt. Hope, Trinidad (7th – 8th June 2018)
- The International Conference on Ship Energy Efficiency, Vienna International Hotel, Shanghai (9th – 10th July 2018);
- China Maritime Forum, W Shanghai (11th July 2018);
- The Global Forum on Green Shipping Conference, Shanghai International Conference Centre, Shanghai (11th July 2018);
- The Transition to Utility Scale Renewable Energy Generation Energy Seminar, UTT, Point Lisas, Trinidad (27th July 2018);
- Inaugural Research Symposium, UTT, Port of Spain, Trinidad (10th August 2018)
- World Maritime Day, MTCC Caribbean/UTT, Chaguaramas, Trinidad (25th September 2018);
- Maritime Village, Maritime Services Division, Trinidad and Tobago (26th September 2018)
• Women in Maritime Association Caribbean Annual Conference 2018, Belize City, Belize (16th – 19th October 2018);
• GMN Global Stakeholders Committee Meeting and World Maritime University Tailored Course, IMO, London (22nd – 26th October 2018);
• Renewable Energy in Small Islands Developing States: How to Strengthen Resilience and Accelerate Renewable Energy Development Workshop, International Renewable Energy Agency (IRENA), Aruba (28th – 30th November 2018);
• United Nations Framework Convention on Climate Change Quality Assurance of the National Greenhouse Gas Inventory Management System and National Greenhouse Gas Inventories of Trinidad and Tobago, Port of Spain, Trinidad (11th – 15th February 2019);
• Meeting of Officials “Maritime transportation: Harnessing the Blue Economy for the Sustainable Development of the Caribbean”, Montego Bay, Jamaica (26th February 2019);
• High Level Symposium Meeting of Ministers “Maritime Transportation: Harnessing the Blue Economy for the Sustainable Development of the Caribbean”, Montego Bay, Jamaica (27th February 2019);
• Regional Senior Maritime Administrators Workshop, Montego Bay, Jamaica (28th February – 1st March 2019);
• Nationally Determined Contribution (NDC) Support Programme in Trinidad and Tobago: Launch of the Knowledge Management System (KMS) and the Pilot Project for the National Climate Mitigation Monitoring, Reporting and Verification (MRV) System, Port of Spain, Trinidad (12th March 2019);
• Docks The Future Conference, Global MTCC Network Meeting and Technical Workshop, Trieste, Italy (1st – 5th April, 2019);
• Energy Efficiency & Renewables Conference 2019, Trinidad (10th – 11th June 2019);
• Workshop on Gender Mainstreaming in National Sustainable Development Planning in the Caribbean and Caribbean Preparatory Meeting of the XIV Session of the Regional Conference on Women in Latin America and the Caribbean, Economic Commission for Latin America and the Caribbean (ECLAC), Port of Spain, Trinidad (18th – 19th June 2019); and
• Colloquium of Scientific Research in Port Logistics Chain, Chaguaramas, Trinidad (7th August 2019).

6.2.3 Submission of Proposal to Caribbean Memorandum on Port State Control

MTCC Caribbean recognized the importance of partnering with key regional organizations. In this regard the MTCC submitted a proposal to the Secretariat of the Caribbean Memorandum of Understanding on Port State Control in order to promote project awareness and its pilot projects to the wider Caribbean region. This proposal can be seen in Appendix VIII.

6.2.4 Dissemination of information on Pilot Projects

In an effort to promote the Pilot Projects across the Caribbean, the MTCC has leveraged its available social and print media platforms to foster stakeholder awareness and buy in. This has been achieved by featuring articles in our Newsletters, posts on Facebook, posts on Twitter, and facilitating stakeholder discussions at relevant workshops. MTCC Caribbean also launched its promotional video titled “MTCC Caribbean’s Efforts in Maritime Climate Action” on the 12th February 2019. The feedback from the video was positive as stakeholders indicated that they
were also able to share the video to their network which provided further clarification on the project. The video can be accessed online at (https://www.youtube.com/watch?v=Jug9Fp3HL8E&t=8s).

Refer to appendix IX for samples of MTCC Caribbean’s communication and visibility activities in relation to the pilot projects.

7 Results

MTCC Caribbean’s ongoing data collection commenced on the 1st June 2017. The data analyzed for this report spans from the date of commencement until the 31st May 2019. This data represents a sample of the total population of ships operating in the Caribbean region and involves data reported from 1870 regional port calls from 518 ships calling at six countries, namely; The Bahamas, Belize, Guyana, St. Vincent and the Grenadines, Suriname, and Trinidad and Tobago.

The primary purpose of collecting and analyzing the data was to fulfill the objectives of the Center’s two pilot projects. Table 5 identifies the achieved outcomes relating to Pilot Project 2.

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Expected Outcomes</th>
<th>Summary of Achieved Outcomes</th>
</tr>
</thead>
</table>
| Establish data collection systems for the Caribbean region | To create relationships with key maritime stakeholders and synergise the reporting of data via existing channels. To develop MTCC e-portal reporting system. | Relationships were established with key maritime stakeholders:  
- 15 Energy Efficiency Focal Points established within respective regional maritime administrations;  
- Direct Reporting from EE Focal Points, Ports and Major shipping lines within the region;  
- 27 shipping agencies and 22 shipping lines participated in the data collection process;  
- On-going data collection to date; and  
- MTCC Caribbean’s OVRS was developed and launched. |
| Collect data using established data collection system | To capture data from vessels trading within the Caribbean Region. To increase awareness of the reporting requirement as guided by IMO. | Data was collected via the use of the established OVRS, Direct reporting from EE Focal Points, Direct Reporting from Vessels and IHS Fairplay Database. This allowed MTCC Caribbean to capture 21116 port calls amounting to 50% ships calling ports within the region. Capacity building workshops were conducted to increase awareness of the reporting requirements as guided by the IMO. |
Maritime Technology Cooperation Centre Caribbean (MTCC Caribbean)

Communicate collected data

Completion and submission of the Pilot Project Report 2.

Pilot Project Report 2 was completed and submitted to IMO.

| Table 5: Achieved Outcomes for Pilot Project 2 |

7.1 Analysis of EEOI data collected with the use of MTCC Caribbean’s Data Collection Form

Although the total number of data sets collected over the period June 1st 2017 – May 31st 2019 was 1823, the total number of useable data sets for the purpose of calculating GHG emissions, EEOI and Reference Values, were 1203. This was due to incomplete data sets, which did not contain one or more of the variables required for the calculations, and as such could not be used. This 1203 data sets were received from 388 vessels calling at various ports within the Caribbean Region and are categorized in the Table 6 below.

<table>
<thead>
<tr>
<th>Category of Vessels</th>
<th>Number of Data Sets</th>
<th>Number of Vessels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk Carriers</td>
<td>78</td>
<td>50</td>
</tr>
<tr>
<td>Gas Carriers</td>
<td>90</td>
<td>32</td>
</tr>
<tr>
<td>Tankers</td>
<td>252</td>
<td>127</td>
</tr>
<tr>
<td>Container Ships</td>
<td>387</td>
<td>37</td>
</tr>
<tr>
<td>General Cargo Ships</td>
<td>57</td>
<td>41</td>
</tr>
<tr>
<td>Refrigerated Cargo Carriers</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Combination Carriers</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Ro-Ro Cargo Ships (Vehicle Carriers)</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>Ro-Ro Cargo Ships</td>
<td>23</td>
<td>2</td>
</tr>
<tr>
<td>LNG Carriers</td>
<td>111</td>
<td>42</td>
</tr>
<tr>
<td>Cruise Ships</td>
<td>179</td>
<td>32</td>
</tr>
<tr>
<td>Total</td>
<td>1203</td>
<td>388</td>
</tr>
</tbody>
</table>

| Table 6: Vessel type for the data sample collected using MTCC Data collection form |

To ensure consistency in the calculations, the following deductions were made:

- The Total Fuel Consumed was calculated by tallying the total HFO, MGO and MDO used for the voyage as recorded on the MTCC Caribbean Data Collection Form
- Standard values for the Carbon Factor (CF) for marine fuels were applied as per [Resolution MEPC.245(66)]
The distance sailed in nautical miles was taken as the actual distance recorded on the MTCC Caribbean Data Collection Form.

The cargo mass carried or work done was expressed in metric tonnes for bulk carriers, gas carriers, tankers, container ships, general cargo ships, refrigerated cargo ships, combination carriers, ro-ro cargo ships (Vehicle carriers), Ro-Ro Passenger Ships, Ro-Ro cargo ships, and LNG Carriers. For Cruise Ships, the cargo mass carried/work done was expressed in gross tonnes (MEPC.1/Circ.684).

### 7.1.1 Calculation of GHG Emissions

GHG emissions were calculated by multiplying the appropriate Carbon Factor to the corresponding type and amount of fuel used.

\[
\text{Fuel Consumed (tonnes)} \times \text{Carbon Factor} = \text{GHG Emissions}
\]

<table>
<thead>
<tr>
<th>Category of Vessels</th>
<th>GHG Emissions (tonnes of CO2e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk Carriers</td>
<td>32058.51046</td>
</tr>
<tr>
<td>Gas Carriers</td>
<td>57228.92804</td>
</tr>
<tr>
<td>Tankers</td>
<td>115044.9115</td>
</tr>
<tr>
<td>Container Ships</td>
<td>100990.1741</td>
</tr>
<tr>
<td>General Cargo Ships</td>
<td>17683.99565</td>
</tr>
<tr>
<td>Refrigerated Cargo Carriers</td>
<td>2959.6284</td>
</tr>
<tr>
<td>Combination Carriers</td>
<td>295.1902</td>
</tr>
<tr>
<td>Ro-Ro Cargo Ships (Vehicle Carriers)</td>
<td>5094.7868</td>
</tr>
<tr>
<td>Ro-Ro Cargo Ships</td>
<td>4598.744316</td>
</tr>
<tr>
<td>LNG Carriers</td>
<td>658718.8076</td>
</tr>
<tr>
<td>Cruise Ships</td>
<td>32832.68747</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1027506.364</strong></td>
</tr>
</tbody>
</table>

*Table 7: GHG Emissions based on sample collected using MTCC Data collection form*
7.1.2 Calculation of EEOI – MTCC Caribbean’s Data Collection Form

The EEOI (g CO₂ /ton n-mile) is calculated as per the following equation:

\[
\text{Fuel Consumed (g) \times Emission Factor} \div \text{Cargo Mass (tonne) \times Distance Sailed (nautical mile)}
\]

7.1.2.1 Bulk Carriers

The EEOI Values were calculated for the voyages captured in the data sets, and the results are shown in reference to the corresponding DWT, in the chart below:

\[
a \times b^{-c}
\]

Figure 10: EEOI vs DWT for Bulk Carriers
### 7.1.2.2 Gas Carriers

The EEOI Values were calculated for the voyages captured in the data sets, and the results are shown in reference to the corresponding DWT, in the chart below:

![Figure 11: EEOI vs DWT for Gas Carriers](image-url)
7.1.2.3  Tankers

The EEOI Values were calculated for the voyages captured in the data sets, and the results are shown in reference to the corresponding DWT, in the chart below:

![Figure 12: EEOI vs DWT for Tankers](image-url)
7.1.2.4 Container Ships

The EEOI Values were calculated for the voyages captured in the data sets, and the results are shown in reference to the corresponding DWT, in the chart below:

Figure 13: EEOI vs DWT for Container Ships
7.1.2.5 General Cargo Ships

The EEOI Values were calculated for the voyages captured in the data sets, and the results are shown in reference to the corresponding DWT, in the chart below:

![EEOI vs DWT for General Cargo Ships](image)

*Figure 14: EEOI vs DWT for General Cargo Ships*
7.1.2.6 Refrigerated Cargo Carriers

The EEOI Values were calculated for the voyages captured in the data sets, and the results are shown in reference to the corresponding DWT, in the chart below:

![Figure 15: EEOI vs DWT for Refrigerated Cargo Carriers](image)

Figure 15: EEOI vs DWT for Refrigerated Cargo Carriers
7.1.2.7 Combination Carriers

The EEOI Values were calculated for the voyages captured in the data sets, and the results are shown in reference to the corresponding DWT, in the chart below:

Figure 16: EEOI vs DWT for Combination Carriers
7.1.2.8  Ro-Ro Cargo Ships (Vehicle Carriers)

The EEOI Values were calculated for the voyages captured in the data sets, and the results are shown in reference to the corresponding DWT, in the chart below:

![Figure 17: EEOI vs DWT for Ro-Ro Cargo (Vehicles) Ships](image-url)
7.1.2.9 Ro-Ro Cargo Ships

The EEOI Values were calculated for the voyages captured in the data sets, and the results are shown in reference to the corresponding DWT, in the chart below:

![EEOI vs DWT for Ro-Ro Cargo Ships](chart.png)

*Figure 18: EEOI vs DWT for Ro-Ro Cargo Ships*
7.1.2.10 LNG Carriers

The EEOI Values were calculated for the voyages captured in the data sets, and the results are shown in reference to the corresponding DWT, in the chart below:

![EEOI vs DWT for LNG Carriers](image)

*Figure 19: EEOI vs DWT for LNG Carriers*
7.1.2.11 Cruise Ships

The EEOI Values were calculated for the voyages captured in the data sets, and the results are shown in reference to the corresponding DWT, in the chart below:

![Figure 20: EEOI vs DWT for Cruise Ships](image-url)
7.2 Analysis of EEOI data collected with the use of IHS database and AIS Live

The total number of data sets collected through the use of the IHS Database for the purpose of calculating GHG emissions, EEOI and Reference Values, were 21116. These data sets were collected from 1702 vessels calling at various ports within the Caribbean Region, and is categorized in Table 8 below:

<table>
<thead>
<tr>
<th>Category of Vessels</th>
<th>Number of Data Sets</th>
<th>Number of Vessels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk Carriers</td>
<td>1095</td>
<td>352</td>
</tr>
<tr>
<td>Gas Carriers</td>
<td>521</td>
<td>30</td>
</tr>
<tr>
<td>Tankers</td>
<td>3792</td>
<td>503</td>
</tr>
<tr>
<td>Container Ships</td>
<td>4887</td>
<td>210</td>
</tr>
<tr>
<td>General Cargo Ships</td>
<td>3460</td>
<td>287</td>
</tr>
<tr>
<td>Refrigerated Cargo Carriers</td>
<td>717</td>
<td>64</td>
</tr>
<tr>
<td>Ro-Ro Cargo Ships (Vehicle Carriers)</td>
<td>559</td>
<td>78</td>
</tr>
<tr>
<td>Ro-Ro Cargo Ships</td>
<td>597</td>
<td>13</td>
</tr>
<tr>
<td>Ro-Ro Passenger Ships</td>
<td>1850</td>
<td>7</td>
</tr>
<tr>
<td>Cruise Ships</td>
<td>3638</td>
<td>158</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>21116</strong></td>
<td><strong>1702</strong></td>
</tr>
</tbody>
</table>

Table 8: Vessel type for the data sample collected with the use of IHS Markit Database

To ensure consistency in the calculations, the following deductions were made:

1. The Specific Fuel Oil Consumption (g/kWh) and the power (kW) of the machinery on board was used to account for the total fuel consumed for the voyage

$$ EEDI = \frac{\text{Power} \times \text{Carbon Factor} \times SFOC}{\text{Capacity} \times \text{Speed}} $$

2. Standard values for the Carbon Factor (CF) for marine fuels were applied as per [Resolution MEPC.245(66)]
3. The distance sailed in nautical miles was calculated using the time taken for the voyage and the speed of the vessel.

4. The cargo mass carried or work done was expressed in metric tonnes for bulk carriers, gas carriers, tankers, container ships, general cargo ships, refrigerated cargo ships, combination carriers, ro-ro cargo ships (Vehicle carriers), Ro-Ro Passenger Ships, Ro-Ro cargo ships, and LNG Carriers. For Cruise Ships, the cargo mass carried/ work done was expressed in gross tonnes (MEPC.1/Circ.684).

7.2.1 Calculation of GHG Emissions

GHG emissions were calculated by multiplying the appropriate Carbon Factor to the corresponding type and amount of fuel used as shown in table 9 below:

\[
\text{Fuel Consumed (tonnes) \times Carbon Factor = GHG Emissions}
\]

<table>
<thead>
<tr>
<th>Category of Vessels</th>
<th>GHG Emissions (tonnes of CO2e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk Carriers</td>
<td>355204.40</td>
</tr>
<tr>
<td>Gas Carriers</td>
<td>78342.28</td>
</tr>
<tr>
<td>Tankers</td>
<td>466766.99</td>
</tr>
<tr>
<td>Container Ships</td>
<td>819041.10</td>
</tr>
<tr>
<td>General Cargo Ships</td>
<td>18469.18</td>
</tr>
<tr>
<td>Refrigerated Cargo Carriers</td>
<td>172122.87</td>
</tr>
<tr>
<td>Ro-Ro Cargo Ships (Vehicle Carriers)</td>
<td>49666.12</td>
</tr>
<tr>
<td>Ro-Ro Cargo Ships</td>
<td>12718.63</td>
</tr>
<tr>
<td>Ro-Ro Passenger Ships</td>
<td>21262.27</td>
</tr>
<tr>
<td>Cruise Ships</td>
<td>819957.11</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2813550.95</strong></td>
</tr>
</tbody>
</table>

Table 9: GHG Emissions based on sample collected with the use of IHS Markit Database
7.2.2 Calculation of EEOI - HIS Fairplay

The EEOI (g CO₂/tnm) is calculated as per the following equation:

\[
\frac{\text{Fuel Consumed (g) } \times \text{Emission Factor}}{\text{Cargo Mass (tonne) } \times \text{Distance Sailed (nautical mile)}}
\]

7.2.2.1 Bulk Carriers

The EEOI Values were calculated for the voyages captured in the data sets, and the results are shown in reference to the corresponding DWT, in the chart below:

![Figure 21: EEOI vs DWT for Bulk Carriers](image-url)
7.2.2.2 Gas Carriers

The EEOI Values were calculated for the voyages captured in the data sets, and the results are shown in reference to the corresponding DWT, in the chart below:

![Figure 22: EEOI vs DWT for Gas Carriers](image)
7.2.2.3 Tankers

The EEOI Values were calculated for the voyages captured in the data sets, and the results are shown in reference to the corresponding DWT, in the chart below:

Figure 23: EEOI vs DWT for Tankers
7.2.2.4 Container Ships

The EEOI Values were calculated for the voyages captured in the data sets, and the results are shown in reference to the corresponding DWT, in the chart below:

![Figure 24: EEOI vs DWT for Container Ships](image-url)
7.2.2.5 General Cargo Ships

The EEOI Values were calculated for the voyages captured in the data sets, and the results are shown in reference to the corresponding DWT, in the chart below:

Figure 25: EEOI vs DWT for General Cargo Ships
7.2.2.6 Refrigerated Cargo Carriers

The EEOI Values were calculated for the voyages captured in the data sets, and the results are shown in reference to the corresponding DWT, in the chart below:

![Figure 26: EEOI vs DWT for Refrigerated Cargo Carriers](image-url)
7.2.2.7 Ro-Ro Cargo Ships (Vehicle Carriers)

The EEOI Values were calculated for the voyages captured in the data sets, and the results are shown in reference to the corresponding DWT, in the chart below:

![Figure 27: EEOI vs DWT for Ro-Ro (Vehicle) Carriers](image)
7.2.2.8  Ro-Ro Cargo Ships

The EEOI Values were calculated for the voyages captured in the data sets, and the results are shown in reference to the corresponding DWT, in the chart below:

*Figure 28: EEOI vs DWT for Ro-Ro Cargo Ships*
7.2.2.9 Ro-Ro Passenger Ships

The EEOI Values were calculated for the voyages captured in the data sets, and the results are shown in reference to the corresponding DWT, in the chart below:

Figure 29: EEOI vs DWT for Ro-Ro Passenger Ships
7.2.2.10 Cruise Ships

The EEOI Values were calculated for the voyages captured in the data sets, and the results are shown in reference to the corresponding DWT, in the chart below:

Figure 30: EEOI vs DWT for Cruise Ships
7.3 Pilot project 2 - Pilot-Scale Voluntary Data Collection and Reporting Systems

The pilot project 2 aimed at establishing a fuel consumption reporting system. Activities under this project were twofold, and aimed to:

- Engage in capacity building activities with respective maritime administrations and raise their awareness on reporting system requirements as per MARPOL Annex VI Reg 22A; and
- Create a specific pilot regional voluntary reporting system collecting data on fuel consumption and energy efficiency (formally independent from the mandatory data collection and reporting of regulation 22A of MARPOL Annex VI).

Reporting and recording the required data allowed the mechanism for tracking data on fuel consumption between ports, the type of fuel used, and ship speed between ports. The Voluntary reporting system was developed based on a vision of a regional reporting system as per figure 31.

![Figure 31: Vision of regional reporting system](image)

By completion of the project, MTCC Caribbean had successfully established a regional reporting system as described under section 3.2. The established regional reporting at this moment is illustrated in figure 32.
Figure 32: MTCC Caribbean Voluntary Data collection system
During various Capacity building activities, stakeholders were also apprised of the requirements of MARPOL Annex VI Reg 22A. Table 10 below outlines the feedback provided by respective maritime administrations after consultations with MTCC Caribbean.

<table>
<thead>
<tr>
<th>Country</th>
<th>Vessel Reporting Mechanism</th>
</tr>
</thead>
</table>
| Antigua & Barbuda             | - All commercial vessels above 24m (=SCV-Code) length to be eligible for A&B registration have to be classed by a RO (ADOMs has mandated these ROs in respect of the relevant data collection for their vessels).  
- ADOMS has also entered into agreements with some independent verification providers available to our esteemed clientele.  
- The data collected is submitted to IMO, either directly by the collectors as endorsed by our administration, or via the administration. |
| Belize                        | - The International Merchant Marine Registry of Belize (IMMARBE) sent out a circular to their fleet informing them that they will submit to their RO then the RO will forward to IMMARBE.  
- They are looking to secure a database system from two service providers.                                                                                                                                                      |
| Jamaica                       | - MAJ is in the process of creating a questionnaire that will be sent to owners of vessels above 500gt.  
- The aim of the Administration is to collect data on the fuel oil consumption of the vessels and the general trading pattern of the vessels. MAJ's "Energy team" and an international verifier will analyse how energy efficiency may be improved on the vessels.  
- The energy improvement measures will be quantitatively monitored and submitted annually to the IMO.                                                                                                                |
| St. Vincent & The Grenadines  | St. Vincent & The Grenadines Maritime Administration has issued circular No POL 022 – Fuel oil consumption data collection system – with the administration’s intention of authorizing the Recognized Organizations (RO) to conduct fuel consumption data collection and reporting on its behalf. |
| Trinidad and Tobago           | - Vessel owners of vessels 5000GT and above on the T&T Register are requested, via letter, to submit data in accordance with Appendix IX Information to be submitted to the IMO Ship Fuel Oil Consumption Database.                                          |

Table 10: Reporting system established by Maritime Administrations as required by Reg 22A of MARPOL Annex 22A
8 Data Analysis & Discussions

The collected was analyzed for EEOI calculations. The data also provided the type and quantity of fuel consumed by auxiliary engines and boilers on board vessels.

Only data reported through MTCC Caribbean’s voluntary reporting system allowed for the analysis of existing EE Technology and Abatement methods onboard, as the IHS database does not contain this information. This is the first such database providing this type of information on the vessels calling within the region.

The data collected is also of great relevance given that 91% of the vessels were 5,000 GRT and above in size, as it is estimated that 85% of GHG emissions from the sector are caused by vessels in this size range\(^2\), and these are the vessels to be targeted to reduce emissions within the sector.

The voluntary data collection system was only established in the 6 countries. The institutional capacity and legislation are two major challenges in establishing a similar reporting. Certain Maritime Administrations issued the notice detailing the requirements of the voluntary reporting. However, it will be beneficial that data be obtained in a standard format for all the ships in region. The reporting form can be further simplified and targeted to a very specific format. Reporting of such data on each arrival and departure will allow direct upload of dataset into the system. The portal should also allow any stakeholder (ship agent, ship operator) with such data to upload in the system. This will also prevent any additional load on ship staff.

8.1 EEOI Baseline calculations

Ships are designed and built for a certain specified load and speed range, at which the system’s total efficiency is optimized. Ships are specifically designed, and their engines and propulsion systems installed to maintain their optimized operating range. However, the operating demands may be different from these designed capacities. Such operational demands affect voyage performance. Variations in operating conditions such as higher speed and deadweight (amount of cargo moved) directly impact EEOI values. Speed was identified as the major factor contributing to higher fuel consumption and higher values of EEOI.

Specifically, in the case of container vessels, it was observed that vessels operated at a constant service speed regardless of the change in deadweight. In some instances, there were no speed reductions reported even when departure displacement was 38% less than the previous voyage. This may be due to a number of reasons ranging from the lack of transport demand to poor design of the ship. If the ratio of speed and cargo carrying capacity can be maintained, ideally by eliminating reserve cargo capacity, the overall efficiency of the ship will improve as calculated in the EEOI.

Lower EEOI values indicate more efficient operation of the vessel. Lowered EEOI values can be achieved by increasing the deadweight, implementing operational measures and adopting technology use to reduce fuel consumption. The establishment of the EEOI baseline along with

the database of existing EE technology and emission abatement methods onboard ships will provide a clear scope of energy efficiency improvement relevant to the vessels operating within the region. An example for determining the scope of energy efficiency is depicted in figure 33 below.

The EEOI calculation as explained under sections 7.1 and 7.2 demonstrates that vessels operating within Caribbean region follow the trend where EEOI improves with increase in deadweight. The lack of consistency in findings can also be linked to the nature of voyages and the accuracy of data reported.

Data analysis based on Bottom up method 2 provides similar EEOI trends as obtained via Bottom up method 1. However, method 1 is premised on direct activity-based data from ships as compared to method 2. But both results show consistency among the vessel types and sizes. This finding also supports the hypothesis under section 8.2. Establishing a relationship between technology use onboard and EEOI.

The relationship between the level of technology onboard and the related reduction in emissions was evident based on the data collected in this project. Usually, the age of the vessel is associated with the modernization of the vessel; however, it is evident that even though the vessel is complying with the requirements under of MARPOL Annex VI, there may exist scope for improvement based on the scope of technology available.

Bulk carriers were the youngest of the vessel types when compared to others. 62% of the bulk carriers which reported using MTCC Caribbean’s Data collection form were less than 10 years of age, while another 18% were between 11 to 15 years old. The level of technology used onboard was mature and they are reliant on alternative or low Sulphur fuels for emission control. In comparison, even though 48% of cruise ships reporting were between 6 to 10 years old and 35% between 16 to 25 years of age, they also lead the vessel types in the level of existing technologies, especially abatement methods. They are also the greatest number of vessels equipped with
scrubbers as presently 62% of these use HFO as their major fuel. The data on cruise ships is of high relevance given that 54 different ships participated in the data collection process which is equal to the total number of cruise ships within the Caribbean region at any given time.

Given the findings of Pilot project 1, the existing technologies on majority of vessels are mature in nature. The ships making their entire voyages within the Caribbean region are usually smaller in size (deadweight) compared to the vessels calling one port in the region. This leaves a scope for improving EEOI using a suitable mix of semi mature and non-mature technologies for different type and size of ships.

9 Conclusions

The pilot projects executed by MTCC Caribbean successfully established a voluntary reporting system in addition to tracking EE technology and fuel consumption onboard ships calling ports within the Caribbean region. The data collected through this voluntary reporting system established;

- A baseline of GHG emissions and EEOI from ships calling to ports in the Caribbean (captures 50% of ships in the combined approached);
- A baseline of existing EE Technology onboard ships trading in the Caribbean (captures 62% of ships > 400GT);
- An EE database for the region; and
- An inventory of the type of fuel consumed by vessels within the region (Captures 62% of ships > 400GT).

This is of significant relevance to the region, especially given the significance of the upcoming 2020 Sulphur cap and the implementation of IMO GHG Initial Strategy with well-defined targets. In addition to data collection, the pilot projects were also key in increasing the capacity of regional stakeholders with respect to awareness of shipboard energy efficiency measures, technology and emission abatement methods.

The relevance of economic and regulatory factors driving the shipping sector was evident in the data collected. Any further uptake of technology is highly dependent on the economic viability of the technology. The results of these pilot projects, in combination with the technology needs assessment, can provide a clear path towards a technology action plan.

In order to reach the sustainability objectives for the shipping sector and decrease CO₂ emissions significantly, steps towards stricter policies and regulations related to alternative fuels and ship design need to be taken at the regional level. These steps should involve private partners from the industry, rather than relying solely on the regulatory environment which is lagging in the majority of participating countries. However, the private stakeholders and ports in the region can still facilitate the process by using environmentally differentiated port dues and by offering alternative fuel supplies in port. Figure 34 summarizes the major drivers which will be catalytic to the introduction of new upcoming EE technologies to the region.
Higher bunker fuel prices, market over-capacity and low freight rates combined, provide justification for slow steaming. In addition to economic benefits, slow steaming reduces the GHG emissions and carbon footprint of operations. These savings and advantages of slow steaming cannot be neglected and many operators in industry are using them as an immediate measure for cutting down fuel costs. Along with fuel, the cylinder oil (lubricating) consumptions of main engine are also reduced in similar percentages as the fuel. However, the viability of slow steaming cannot be completed without considering three main factors – commercial perspectives, technical capabilities of main engine and availability of operational solutions.

There is a strong need for a regional approach with the establishment of a programme covering all interrelated actions for the diffusion of EE technologies. These activities will require large scale funding and depend on international donors or public / private sector grants. The implementation of specific prioritized technologies can be sponsored by the stakeholders benefiting from such activity. Small scale technology uptake pilot projects, for ships within the region as well as ports will provide solutions to some of the existing energy efficiency and maritime emissions challenges within the Caribbean region.

MTCC’s OVRS has laid the foundations for ongoing data collection to assist the shipping industry and maritime administrations for the monitoring and analysis of vessels operating within the region. At the close of June 2019, six maritime administrations consistently participated in the OVRS. Through continued outreach by MTCC Caribbean, widespread adoption and implementation of the OVRS is anticipated within the Wider Caribbean Region.

The data collected through the OVRS and analysed by MTCC Caribbean will provide policy makers with access to the relevant data to facilitate informed decision making at the National and Regional level. The OVRS can be adapted to meet the demands of the region.
Appendices

Appendix I – Shipping Notice Issued by Maritime Services Division Trinidad and Tobago in support of MTCC Caribbean data reporting system.

MINISTRY OF WORKS AND TRANSPORT
Maritime Services Division

SHIPPING NOTICE

SN 1 - 2017

REPORTING SYSTEM ESTABLISHED FOR THE PURPOSE OF ENERGY EFFICIENCY AND FUEL CONSUMPTION DATA COLLECTION

Notice to Ship Owners, Operators, Masters, Crew, Ports, Trinidad and Tobago Coast Guard, Trinidad and Tobago Pilots’ Association, Shipping Association, Seamen and Waterfront Workers Trade Union, Yachting Association.

Summary

The Ministry of Works and Transport, Maritime Services Division (Harbour Master) wishes to advise the shipping community that with effect from 1st June 2017 agents acting on behalf of the ship owners/masters are required to report on the energy efficiency of the vessels they represent.

1. INTRODUCTION

The Maritime Services Division (MSD), is a specialised executive arm of Ministry of Works and Transport Trinidad and Tobago, established to administer the National Shipping and Maritime framework. The MSD is also responsible for implementing regulatory functions embodied in the legislation with the intent of ensuring safety and security of life at sea, navigation and protection of the marine environment.

In keeping with Trinidad and Tobago’s obligations under the International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 (MARPOL Convention), the MSD requires data on energy efficiency measures and fuel consumption. The data collected will assist in capturing Green House Gas (GHG) emissions and the use of energy efficient technology on-board vessels. The ultimate objective of the convention is to achieve a reduction of GHG emissions from ships.

2. REPORTING SYSTEM

Under the International Maritime Organisation’s (IMO) Global MTCC Network (GMN) project, the Maritime Technology Cooperation Centre Caribbean (MTCC Caribbean) is established in Trinidad and Tobago. The MSD as the technical focal point and compliance authority for the IMO, requires ships arriving and operating within Trinidad and Tobago waters to comply with the reporting system established for the purpose of energy efficiency and fuel consumption data collection.

Effective Date: The reporting as mentioned in this notice is mandatory from 1st June, 2017.

Application: Ships of 400 GRT and above are required to complete and submit the MTCC Caribbean Reporting Form on arrival. Vessels smaller than 400 GRT are encouraged to participate in reporting system.

Reporting Arrangements: The reporting form is in excel format and available for download on the TTBizLink website at www.ttbizlink.gov.tt. The transmission of the reporting form will be through the e-Maritime Services Module on TTBizLink. Agents are to upload it as a supporting document when completing the vessel’s arrival declaration.

Responsibility for Reporting: The ship’s master, or a person authorised by him/her (i.e. a ship’s agent), is responsible for completing the report and ensure that reported information is correct. The shipping agent usually will upload the report on behalf of the master through TTBizLink.
Timing of Reporting: Ship-owners, Operators and Masters of vessels required to report under this system must submit the required information without delay on arrival and, if necessary, when leaving the ports within Trinidad and Tobago. A ship may be required to provide additional reports or information to update or modify an earlier report. If a technical failure prevents a ship from reporting using electronic means, the Master should provide such information on arrival through services of appointed agents.

Formats of Reporting: Users must only use the Excel forms available via the SEW to input data. Further instructions on how to complete the forms are available on the SEW website. No other format of the reporting form will be accepted. Please do not use forms from any other source other than the SEW website.

Non-Compliance: Failure to comply with this reporting requirement can lead to delays in the granting of departure clearance from MSD.

Further information can be obtained from:-

Ministry of Works and Transport
Maritime Services Division
Clarence House
127 – 129 Duke Street
Port of Spain

Telephone: 625-3898/3218/3804/223-4351
Facsimile: 624-5884
E-mail: maritime.services@gov.tt or mtcc@utt.edu.tt

Director Maritime Services
Ministry of Works and Transport

1st May 2017
Appendix II – Pictures from the Stakeholder Workshop

MTCC Team explaining Data collection form to stakeholders from Eastern Caribbean region

Data collection Process being shared with Stakeholders
Maritime Technology Cooperation Centre Caribbean (MTCC Caribbean)

MTCC Technical Officer Ms. Suzette Balkaran explaining the use of collected data

Mr. Isikeli Waqa explaining the use of efficient methods on a diesel engine

MTCC Technical Officer Mr. Michael Razack explaining the MTCC Data collection form
Simulation of Various EE technologies and Abatement methods being shared with Stakeholders
### Appendix III – Sample of Record of meeting with Shipping Agents

#### Records of Meetings with Shipping Agents - MTCC Caribbean’s Data Collection Process

<table>
<thead>
<tr>
<th>Date: Tuesday 12th June 2018</th>
<th>Location: Caracas St. P.O.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FACILITATOR(S)</strong></td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>Signature</td>
</tr>
<tr>
<td>Suzette Balkaran</td>
<td>Suzette C. Balkaran</td>
</tr>
</tbody>
</table>

**SHIPPING AGENCY**

<table>
<thead>
<tr>
<th>Name</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Name: General Agents Co. Ltd.</td>
<td></td>
</tr>
<tr>
<td>Address: 16 Charles Street, P.O.S.</td>
<td></td>
</tr>
<tr>
<td>Contact Information: 025-3611/4914</td>
<td></td>
</tr>
</tbody>
</table>

**ATTENDEE(S)**

<table>
<thead>
<tr>
<th>Name</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Deese-Ann Hare-Nett</td>
</tr>
<tr>
<td>2.</td>
<td>Kamal Antar</td>
</tr>
<tr>
<td>3.</td>
<td>Crystal Charles</td>
</tr>
<tr>
<td>4.</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td></td>
</tr>
</tbody>
</table>
### Records of Meetings with Shipping Agents - MTCC Caribbean’s Data Collection Process

<table>
<thead>
<tr>
<th>Date: Tuesday 12th June 2018</th>
<th>Location: Cadehos St. P.O.S.</th>
</tr>
</thead>
</table>

**FACILITATOR(S)**

<table>
<thead>
<tr>
<th>Name</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suzette Balkaran</td>
<td>Suzette C. Balkaran</td>
</tr>
</tbody>
</table>

**SHIPPING AGENCY**

<table>
<thead>
<tr>
<th>Name: Gordon Garrett &amp; Co. Limited</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address: 10 Charles Street, P.O.S.</td>
</tr>
<tr>
<td>Contact Information: 625-3811 / 4710</td>
</tr>
</tbody>
</table>

**ATTENDEE(S)**

<table>
<thead>
<tr>
<th>Name</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Jessie Marie Hooper-Norgill</td>
<td>Jessie Marie Hooper-Norgill</td>
</tr>
<tr>
<td>2. Kamel Annan</td>
<td></td>
</tr>
<tr>
<td>3. Crystal Charles</td>
<td></td>
</tr>
</tbody>
</table>

| 4.                           |                 |
| 5.                           |                 |
| 6.                           |                 |
| 7.                           |                 |
| 8.                           |                 |
| 9.                           |                 |
| 10.                          |                 |
### Appendix IV – Data Collection Form & Guidance Document

#### 1. Vessel General Information

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Name</td>
<td>Name of the person completing the form</td>
</tr>
<tr>
<td>IMO Number</td>
<td>International Maritime Organization Number of the vessel</td>
</tr>
<tr>
<td>Ship Type</td>
<td>Type of vessel (e.g., Container, Passenger, Tanker)</td>
</tr>
<tr>
<td>Identification Number</td>
<td>Unique identifier for the vessel</td>
</tr>
<tr>
<td>Shipping/Operator/Company</td>
<td>Name of the shipping company/owner/agent</td>
</tr>
</tbody>
</table>

**Please Proceed to Section 2 Voyage Data if information under Sections 2 to 3 has been previously submitted.**

#### 2. Vessel Particulars

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length Overall (m)</td>
<td>Overall length of the vessel</td>
</tr>
<tr>
<td>Breadth Molded (m)</td>
<td>Breadth of the vessel</td>
</tr>
<tr>
<td>Depth Molded (m)</td>
<td>Depth of the vessel</td>
</tr>
</tbody>
</table>

#### 3. Vessel Speed & Fuel

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Speed (kn)</td>
<td>Nominal speed of the vessel</td>
</tr>
<tr>
<td>Fuel Consumption (t/year)</td>
<td>Fuel consumption rate of the vessel</td>
</tr>
</tbody>
</table>

#### 4. Vessel Energy Efficiency Design Index (REEI)

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine Efficiency Rating</td>
<td>Efficiency rating of the engine</td>
</tr>
<tr>
<td>Fuel Type</td>
<td>Type of fuel used</td>
</tr>
</tbody>
</table>

#### 5. Propulsion System

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Engine Type</td>
<td>Type of main engine</td>
</tr>
<tr>
<td>Main Engine Manufacturer</td>
<td>Manufacturer of the main engine</td>
</tr>
<tr>
<td>Auxiliary Engine Power (kW)</td>
<td>Power output of the auxiliary engine</td>
</tr>
<tr>
<td>Auxiliary Engine Manufacturer</td>
<td>Manufacturer of the auxiliary engine</td>
</tr>
</tbody>
</table>

#### 6. Electric Power Supply System

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric System Type</td>
<td>Type of electric system</td>
</tr>
<tr>
<td>Electric System Manufacturer</td>
<td>Manufacturer of the electric system</td>
</tr>
</tbody>
</table>

#### 7. Auxiliary Profile

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auxiliary System Type</td>
<td>Type of auxiliary system</td>
</tr>
<tr>
<td>Auxiliary System Manufacturer</td>
<td>Manufacturer of the auxiliary system</td>
</tr>
</tbody>
</table>

#### 8. Energy Saving Technologies

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste Heat Recovery</td>
<td>Recovery of waste heat</td>
</tr>
<tr>
<td>Water Heater Efficiency</td>
<td>Efficiency of water heater</td>
</tr>
</tbody>
</table>

#### 9. Emission Control Measures

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoke Emission Control</td>
<td>Measures for reducing smoke emission</td>
</tr>
<tr>
<td>Noise Emission Control</td>
<td>Measures for reducing noise emission</td>
</tr>
</tbody>
</table>

#### 10. Voyage Data

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voyage Distance (nm)</td>
<td>Distance of the voyage</td>
</tr>
<tr>
<td>Voyage Time (h)</td>
<td>Time duration of the voyage</td>
</tr>
</tbody>
</table>

#### 11. Fuel Consumption Data

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Fuel (t)</td>
<td>Total fuel consumed</td>
</tr>
<tr>
<td>Total SFO (t)</td>
<td>Total SFO fuel consumed</td>
</tr>
<tr>
<td>Total HFO (t)</td>
<td>Total HFO fuel consumed</td>
</tr>
</tbody>
</table>

#### 12. Representative Sea Conditions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Wave Period (days)</td>
<td>Mean wave period for the voyage</td>
</tr>
<tr>
<td>Mean Wind Direction (deg)</td>
<td>Mean wind direction for the voyage</td>
</tr>
<tr>
<td>Mean Wave Height (m)</td>
<td>Mean wave height for the voyage</td>
</tr>
</tbody>
</table>

Submit the completed form to: mtc@mtcc.tt

---

69

MTCC Caribbean’s Pilot Project Report 2
This document is to be used as a guiding document to complete MTCC Caribbean’s Data Collection Form

VESSEL GENERAL INFORMATION

Ship Type: Please choose the type of ship as follows: Buik Carrier, Gas Carrier, Tanker, Container ship, General Cargo ship, Refrigerated cargo carrier, Combination carrier, Passenger ship, Ro-ro passenger ship, Ro-ro cargo ship (Vehicle carrier), Offshore Supply vessel

Shipping Agency: Please state the name of the Shipping Agency Company assigned to this vessel for this particular port call.

VESSEL SPEED & FUEL

\( V_{\text{ref}} \) - ship speed in deep water at summer load line draught @75\%MCR (knots): This is the speed, measured in knots, on deep water at the vessel’s summer load line draft at 75% of the rated installed power or maximum continuous rating (MCR) for each main engine. The MCR value on the nameplate is to be used for this calculation.

Dual-fuel engines: Please state Yes if dual-fuel engines are used, or No if dual-fuel engines are not used.

Type of fuel: Please state the type(s) of fuel(s) used for this voyage.

VESSEL ENERGY EFFICIENCY DESIGN INDEX

Attained EEDI: Please state Yes if there is an attained EEDI for this vessel, or No if one has not been provided.

EEDI Value: Please state the value of EEDI if it has been provided.

PROPULSION SYSTEM

Maximum Continuous Rating (kW): The maximum continuous rated output of the engine as specified by manufacturers.

\( SFC \text{ (g/kWh)}@75\%MCR \): The specific fuel consumption (SFC) of the main engine at the 75% of its maximum continuous rating (MCR) power.

ELECTRIC POWER SUPPLY SYSTEM

\( SFC \text{ (g/kWh)} \): The specific fuel consumption (SFC) of the main engine at the 75% of its maximum continuous rating (MCR) power.

Fuel Type: Please state the type(s) of fuel used for this voyage.

ENERGY SAVING TECHNOLOGY

Please indicate if any of the following energy saving technology are used on the vessel:

- Waste Heat Recovery
- Solar Panels
- M/E Shaft Generator
- Lighting Systems
- Steam Turbine Generator
- Vessel trim/Draft Optimisation
- Air Cavity Lubrication
- Hull Coating Condition
- Contra-rotating Propellers
- Ship Operational Efficiencies (Vessel Speed Reduction/Slow
Steam, Voyage & Route Optimisation, Voyage Planning & Execution), Propeller Bass Cap Fins, Frequency Converters.

Other: (please choose from the following list): Propulsion Engine Derating, Common Rail, Rotating Fuel Injector Controls, Automated Engine Monitoring/Control Systems, High Efficiency Turbochargers, Two Stage Turbochargers, Turbocharger Cut Off, High Efficiency Boilers, Auxiliary Engine Waste Heat Recovery.

EMISSION CONTROL MEASURES

Please indicate if any of the following emission control measures are used on the vessel:


Other: Please state any other emission control measure used on this ship.

VOYAGE DATA

Voyage number: The number allocated to this voyage.
Voyage Distance: The distance in nautical miles covered by vessel for this voyage, from port of departure to port of arrival.
Voyage Time (hrs): The time taken in hours to complete this voyage.
Departure Port: The name of the Port of Departure.
Arrival Port: The name of the Port of Arrival.
Date of Departure: The date of Departure (format dd/mm/yy)
Date of Arrival: The date of Arrival (format dd/mm/yy)
Time of Departure: The time of departure (format 24hours)
Time of Arrival: The time of arrival (format 24hours)
Departure Displacement: The weight of water displaced by this vessel at the waterline upon departure.
Arrival Displacement: The weight of water displaced by this vessel at the waterline upon arrival.

FUEL CONSUMPTION DATA

Departure

Total HFO: Total Heavy Fuel oil on board upon departure.
Total DFO: Total Diesel Fuel oil on board upon departure.
Total GFO: Total Gas Fuel oil on board upon departure.

Arrival

Total HFO: Total Heavy Fuel oil on board upon arrival.
Total DFO: Total Diesel Fuel oil on board upon arrival.
Total GFO: Total Gas Fuel oil on board upon arrival.
**Total Fuel Consumed:**

- **Total HFO:** (Total Departure HFO – Total Arrival HFO)
- **Total DFO:** (Total Departure DFO – Total Arrival DFO)
- **Total GFO:** (Total Departure GFO – Total Arrival GFO)

## REPRESENTATIVE SEA CONDITIONS

**Beaufort Scale #:** The average numerical value rating winds according to the Beaufort Scale as follows:

<table>
<thead>
<tr>
<th>Force</th>
<th>Speed (mph)</th>
<th>Description/Ocean Surface</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0 - 1</td>
<td>Calm; glassy (like mirror)</td>
</tr>
<tr>
<td>1</td>
<td>1 - 3</td>
<td>Light wind; rippled surface</td>
</tr>
<tr>
<td>2</td>
<td>4 - 7</td>
<td>Light breeze; small waves</td>
</tr>
<tr>
<td>3</td>
<td>8 - 12</td>
<td>Gentle breeze; large waves, scattered whitecaps</td>
</tr>
<tr>
<td>4</td>
<td>13 - 18</td>
<td>Moderate breeze; small waves, frequent whitecaps</td>
</tr>
<tr>
<td>5</td>
<td>19 - 24</td>
<td>Fresh breeze; moderate waves, numerous whitecaps</td>
</tr>
<tr>
<td>6</td>
<td>25 - 31</td>
<td>Strong breeze; large waves, white foam crests</td>
</tr>
<tr>
<td>7</td>
<td>32 - 38</td>
<td>Moderate gale; streaky white foam</td>
</tr>
<tr>
<td>8</td>
<td>39 - 46</td>
<td>Fresh gale; moderately high waves</td>
</tr>
<tr>
<td>9</td>
<td>47 - 54</td>
<td>Strong gale; high waves</td>
</tr>
<tr>
<td>10</td>
<td>55 - 63</td>
<td>Whole gale; very high waves, curling crests</td>
</tr>
<tr>
<td>11</td>
<td>64 - 73</td>
<td>Violent storm; extremely high waves, froth and foam, poor visibility</td>
</tr>
<tr>
<td>12</td>
<td>73+</td>
<td>Hurricane; huge waves, thundering white spray, visibility</td>
</tr>
</tbody>
</table>

**Mean Wind Speed (m/s):** The rate at which wind is moving, measured in meters per second.

**Mean Wind Direction (deg):** The average direction from which the wind is blowing, expressed in units of degrees (relative to the longitudinal of the vessel).

**Significant Wave Height (m):** The wave height or vertical distance between a crest and trough, measured in meters.

**Mean Wave Period (s):** The time measured between two crests/two troughs, measured in seconds.

**Mean Wave Direction (deg):** The average direction from which the waves are coming from, expressed in units of degrees (relative to the longitudinal of the vessel).
Appendix V – MTCC Caribbean Information notice 001 of 2018

Information on the differences between the IMO’s mandatory data collection system (DCS) and the MTCC Caribbean Data Collection and Reporting System for pilot projects.

Notice to all Caribbean Maritime Administrations, Ship Agents, Operators, Owners, Ports and other regional maritime stakeholders.

Summary
This notice explains the requirements and differences between the IMO mandatory DCS and the MTCC Caribbean data collection system required for the purpose of the Global Maritime Technology Cooperation Centers Network (GMN) project. The notice emphasizes that data requested by MTCC Caribbean is separate to IMO requirements and cooperation from all stakeholders is essential to achieve the objectives of MTCC Caribbean.

1.0 Introduction
The Paris Agreement on climate change agreed to at the United Nations Framework Convention on Climate Change (UNFCCC) Conference in 2015, appeals for a global response to combat the threat of climate change. Efforts from every industry are being structured around reducing Greenhouse Gases (GHGs) emissions through the use of alternate fuels and/or energy efficiency measures. Whilst the Paris Agreement excludes international shipping, the regulatory body for the industry, the International Maritime Organization (IMO) has implemented a number of strategies geared towards the reduction of greenhouse gas emissions from the sector. These strategies are formulated and implemented through the organization’s Marine Environment Protection Committee (MEPC) and includes the development of MARPOL Annex VI – Prevention of Air Pollution from Ships and IMO Initial GHG Strategy adopted by MEPC (MEPC 72) in April 2018.

MARPOL Annex VI Chapter 4 Regulation 23 – Promotion of technical co-operation and transfer of technology relating to the improvement of energy efficiency of ships involves global projects executed by IMO. One of these projects, the Global Maritime Technology Cooperation Centres Network (GMN) project, has established a network of five Maritime Technology Cooperation Centres (MTCCs) inclusive of MTCC Caribbean. As per IMO GHG studies, ships’ energy consumption and CO₂ emissions could be reduced by up to 75% by implementing operational measures and existing technologies. Improvements in energy efficiency are also important in mitigating increase in emissions. In alignment with this, the deliverables of MTCC Caribbean includes the promotion of the uptake of low-carbon technologies and operational measures for ships trading in the region, and the establishment of a data-collection system applicable to the region.

2.0 IMO Mandatory Data Collection and Reporting
MARPOL Annex VI Chapter 4 Regulation 22A adopted by MEPC (MEPC 70) in October 2016 entered into force on March 1st, 2018 with a mandatory requirement that all commercial ships of 5000 gross tonnage and above, collect data on their fuel oil consumption (each type of fuel used) and transport work parameters. This data is to be submitted in annual reports to their flag State. Once the flag State (hereafter the Administration) has verified that the ship’s SEEMP and the data reported is in accordance with the requirements outlined in Regulation 22A and the 2017 Guidelines for Administration Verification of Ship Fuel Oil Consumption Data, the Administration will issue a Certificate of Compliance to the ship. The Administration will subsequently transfer the data to the IMO Ship Fuel
Oil Consumption Database, and the data will then be used to produce an annual report to MEPC. The Data Collection System (DCS) is the first step of a three steps approach (Data Collection and Reporting → Data Analysis → Decision Making) by the IMO for developing a comprehensive strategy on the reduction of GHG emissions from ships.

The DCS is expected to equip IMO with reliable data which, when analysed, will inform relevant decisions and policies in the MEPC. The data can also be used by Ship Operators to improve the ships’ Energy Efficiency Operational Index (EEOI). Data collection will begin on 1st January, 2019 with first reporting for calendar year 2019 by spring 2020, see timeline in Figure 1.

**Figure 1: IMO DCS Road Map**

Parameters which must be monitored and reported for the IMO DCS includes; Total Fuel Consumption, Hours Underway, Distance Traveled and Methods used to measure parameters.

### 2.1 MTCC Caribbean Data Collection and Reporting System

The objectives of MTCC Caribbean include the mapping of the existing technologies and best practices utilized on-board vessels trading in the Caribbean region. Therefore data must be collected on the use of equipment and machinery on-board including air emissions abatement and energy efficiency technologies being employed. In order to accomplish the objectives, the MTCC Caribbean Data Collection and Reporting System has been established. In this regard, ships of 400 GRT and above are required to submit data using MTCC Caribbean’s Reporting Form. Vessels smaller than 400 GRT are also encouraged to participate in this reporting system. The MTCC Caribbean data collection began on 1st June, 2017 and is ongoing with approximately fifteen percent of vessels currently reporting. For reliable results in the region, a requisite of fifty percent participation is targeted by December 2018 as detailed in Figure 2.

**Figure 2: MTCC Caribbean Data Reporting System Timeline**
The reporting system will also provide the baseline of fuel consumption for ships trading in the Caribbean region. The participating ships will be required to report their fuel oil consumption, and voyage data at each port of call while operating in the region. The data requested under MTCC Caribbean Data Collection and Reporting System is tailored to the needs of MTCC Caribbean’s pilot projects. Consequently, the MTCC Caribbean reporting requirement is more specific than that required for the IMO mandatory DCS.

3.0 Conclusion
The data collection and reporting required for the purpose of MTCC Caribbean’s pilot projects will contribute towards informing policy decisions within the region. The voluntary data reporting system established by MTCC Caribbean for the purpose of pilot projects on energy efficiency technology and fuel consumption, will therefore assist the region in mitigating impacts of shipping emissions. It should be further noted that MTCC Caribbean’s data reporting requirements are not required by IMO as mandated by Regulation 22A and NOT based on the methodology approved in SEEMP. The purpose of MTCC Caribbean data collection system is:
- To facilitate the findings of two pilot projects of MTCC; and
- To create a capacity within each administration to establish a reporting system.

In this regard the cooperation of all stakeholders within all territories in the region is crucial for ensuring that the objectives of all initiatives by the IMO including those of MTCC Caribbean are realised in the attempt to reduce GHG emissions of the global maritime sector.

Further information can be obtained from:
MTCC Caribbean
The University of Trinidad and Tobago
Maritime Campus, Chaguaramas
Trinidad and Tobago, W.I.
email: mtcc@utt.edu.tt
Website: www.a.tt/mtcc-caribbean

Published: May 2018
© MTCC Caribbean Copyright 2018
Appendix VI – MTCC Caribbean’s presentation on the development and use of its Online Voluntary Reporting System and Web Portal

Maritime sector can play key role in climate change initiative

A major effort to reduce greenhouse gas emissions from ships is being spearheaded by MTCC Caribbean - part of a global network of five Maritime Technology Cooperation Centres. Shipping agents and operators can play their part by assisting MTCC Caribbean with its data collection.

The Maritime Technology Cooperation Centre (MTCC) Caribbean, hosted by the University of Trinidad & Tobago, is a part of the ‘Capacity Building for Climate Mitigation in the Maritime Shipping Industry’ project (2016-2019) funded by the European Union and implemented by the International Maritime Organization (IMO).

Five MTCCs have been established—one each in Asia, Africa, the Caribbean, Latin America and the Pacific. Together they constitute the Global MTCC Network (GMN). The central aim of the GMN is to promote technology cooperation and capacity building within the maritime sector to reduce greenhouse gas emissions from ships. To achieve the GMN objectives, MTCC Caribbean aims to:

- Enhance awareness and uptake of environmentally sound technologies and expertise within the Caribbean region,
- Provide advisory and market development services for technology adopters and suppliers,
- Monitor regional energy efficiency needs and align training programs to meet these needs.

PILOT PROJECTS

The MTCC Caribbean initiative also includes two pilot projects aimed at promoting the uptake of energy-efficient technologies and establishing a fuel consumption reporting system for ships trading in the region. Through these pilot projects, a baseline on the use of energy-efficient technologies and the type and quantity of fuel consumption of ships trading in the region will be established.

www.caribbean.maritime.com
Maritime Technology Cooperation Centre Caribbean (MTCC Caribbean)

This baseline data will provide regional stakeholders with data for informed decision-making on investment in energy-efficient technology and emissions abatement and control methods. The data will also highlight to what extent vessels trading in the region are complying with MARPOL Annex VI. This can be used to inform government policies on environmental and maritime affairs. Via a single form, data for both pilot projects is collected on the use of onboard equipment and machinery including air emissions abatement and energy-efficiency technologies. In support of the pilot projects, Energy Efficiency Focal Points have been established in the Caribbean territories for the purpose of collecting data.

KEY PARTNERSHIPS
Key partnerships of maritime sector stakeholders within the 16 Caribbean territories are required for the pilot projects to realize their objectives. These stakeholders include maritime administration, training institutions, ports, technology providers, ship owners, shipping agents, classification societies and pilotage associations. These partnerships are required to facilitate the completion and submission of the MTCC Caribbean’s data collection form.

CAPACITY-BUILDING INITIATIVES
Capacity-building activities are being supplemented by eight workshops. Two regional workshops will be conducted targeting all 16 territories, while six subregional workshops will cater to the specific needs of the northern, eastern and southern Caribbean. The first series of northern, eastern and southern subregional workshops have been hosted in Jamaica, Antigua and Trinidad respectively. Participants included shipping agents, ship owners, ship operators, managers, regulators, ministry representatives, maritime technology providers, green energy providers, international organizations and academics.

CHALLENGES ENCOUNTERED
The major challenges encountered within this project are:
• The voluntary nature of data collection
• The lack of incentives for cooperation
• The non-regulatory requirements for reporting of data to MTCC Caribbean

MITIGATION STRATEGIES
Based on the challenges encountered and the feedback from territories currently reporting data to MTCC Caribbean, there has been greater engagement with ports, ship operators and owners, shipping agents and shipping associations. In addition, MTCC Caribbean has produced an information notice to distinguish between the data required by the IMO’s mandatory data collection system and the data being collected for MTCC Caribbean data collection and reporting system (via MTCC Caribbean’s data collection form) for pilot projects.

FUTURE WORKS
Baselines established from the pilot projects are expected to inform regional decision-making with respect to investment in energy-efficient technology, emissions abatement and control methods for the maritime sector. More engagement is required from industry stakeholders to facilitate the role of MTCC Caribbean in creating a platform for technology transfer and to aid the regional flag states in the development of reporting lines as required by IMO regulations.

MTCC Caribbean is calling on all maritime stakeholders within the Caribbean to strengthen their data collection and reporting efforts in an attempt to reduce greenhouse gas emissions in the sector and mitigate the impact of climate change on the region.

So, shipping agents and operators, are you reporting on MTCC Caribbean’s data collection form?

Energy Efficiency Focal Points have been established in the Caribbean territories for the purpose of collecting data.
1st June, 2018

Mrs. Jodi Munn-Barrow,
Secretary General,
Caribbean Memorandum of Understanding of Port State Control (CMOU)
Department of Marine Services and Merchant Shipping,
P O Box 1394,
Corner Popeshead & Dickenson Bay Streets
St. John’s,
Antigua, W.I.

RE: Collaboration between the Caribbean Memorandum Of Understanding on Port State Control (CMOU) and Maritime Technology Cooperation Centre Caribbean (MTCC Caribbean) for the collection of data from vessels operating within the Caribbean Region

Dear Mrs. Munn-Barrow,

The Maritime Technology Cooperation Centre Caribbean (MTCC Caribbean) is collating and analyzing data for both of our pilot projects currently being undertaken within the Caribbean Region. Through the use of the attached MTCC Caribbean Data Collection Form and Guidance Document, we are mapping the existing emissions abatement technologies in use in addition to the fuel consumption data for vessels calling at ports within the Region. You can visit MTCC Caribbean’s website at www.utt/mgccaribbean for updated information on MTCC Caribbean’s objectives, pilot projects and capacity building initiatives. A brochure is also attached for your perusal.

The Caribbean Maritime Information System (CMIS) database was identified by MTCC Caribbean as a possible avenue for synergy with our data collection and exchange efforts. Following recommendations arising from our recently concluded Eastern Sub-Regional Workshop, we would like to engage in discussion with the Secretariat of the CMOU to:

- Discuss the signing of an MOU between the CMOU and MTCC Caribbean for information sharing and formal cooperation with the CMOU secretariat;
- Discuss support for MTCC Caribbean’s data collection efforts and explore possible mechanisms and resources available within the CMIS database which may be leveraged to promote data collection and exchange; and
- Determine ways we can synergize our efforts to enhance compliance with international conventions and specifically MARPOL Annex VI

In keeping with projects executed by the CMOU such as Concentrated inspections Campaigns (CICs) for familiarization efforts, we would like to discuss the possibility of a similar initiative being embarked upon,
to build awareness of MTCC Caribbean, our pilot projects and the use of MTCC Caribbean’s Data Collection form within the Caribbean Region.

We look forward to your cooperation and participation as we undertake our capacity building initiatives across the region.

Sincerely,

Mrs. Vivian Rambarath-Parasram
Director & Head
MTCC Caribbean
Appendix IX – Samples of MTCC Caribbean’s communication and visibility activities in relation to the pilot projects

**Capacity Building Activities and Pilot Projects**

- Developed a Regional Network for cooperation in Maritime Climate Action across 15 Caribbean territories through EE Focal Points & RSC. The latter is a network comprising Government, Industry and Academia.
- Built capacity and sensitized all 16 Maritime Administrations to the need for urgency in maritime climate action.
- First Online Voluntary Reporting System and Data base for 16 Maritime Administrations on fuel consumption from Ships and use of EE Technology in the region.

**Online Voluntary Reporting System (OVRS)**

MTCC Caribbean’s OVRS was launched at MTCC Caribbean’s 2nd Regional Workshop. This portal provides a double feature as the MTCC Caribbean’s dedicated website and a controlled access platform for sharing tabulated data results and country information relating to MARPOL Annex VI. It provides a database for 16 Maritime Administrations on fuel consumption from Ships and use of Energy Efficient Technology on ships calling in the region.
MTCC Caribbean created the First Energy Efficiency Operational Indicator baseline for vessels trading within the Caribbean Region for the period June 1st 2017 – May 31st 2019. Through the use of the MTCC Data Collection Form, data was collected and then analysed to determine the EEOI of vessels calling at ports within the Caribbean Region.

MTCC Caribbean created the First Emissions Control and Energy Efficient Measures baseline for vessels trading within the Caribbean Region for the period June 1st 2017 – May 31st 2019. Through the use of the MTCC Data Collection Form, the various types emissions control and energy efficient technologies on board vessels trading within the Caribbean Region, was collated.

MTCC Caribbean created the First Greenhouse Gas Emissions baseline for vessels trading within the Caribbean Region for the period June 1st 2017 - May 31st 2019. The data collected on the MTCC Data Collection form was also used to collate the types and quantities of fuel consumed by the vessels and the resulting GHG emissions were calculated.

Visibility on MTCC Caribbean’s pilot projects within MTCC Caribbean’s Newsletter November 2019 Newsletter
Maritime Technology Cooperation Centre for the Caribbean

Published by Michael Razack [?] · October 18 · 👀

A Global Network of Maritime Technology Cooperation Centres has completed an impressive array of pilot projects over the past three years, helping to drive forward the changes which are required to reduce GHG emissions from shipping.

“The MTCC Network is a project that unites maritime experts from all over the world in five MTCCs, to provide capacity building for climate mitigation in the maritime shipping industry. Its work plays an invaluable part in promoting global awareness and in developing global solutions to mitigate GHG emissions from shipping through efficient and sustainable energy use,” said Dr. Cleopatra Doumbia-Henry, WMU President.

#IMO #EuropeanUnion #MTCC #GMN #ClimateAction

Visibility on MTCC Caribbean’s pilot projects on MTCC Caribbean’s Facebook Page
Maritime Technology Cooperation Centre Caribbean (MTCC Caribbean)

MTCC Caribbean @mtcc_caribbean · Oct 8
The MTCCs had a very insightful discussion upon presenting on the impacts of their respective Pilot Projects. Thank you to the @EU_Commission for funding this wonderful initiative and the @IMOHQ for facilitating its implementation and to all the stakeholders involved. #GMN

MTCC Caribbean, IMO, MTCC Africa and 6 others

MTCC Caribbean @mtcc_caribbean · 25 May 2018
Want to know the difference between MTCC Caribbean’s Data Collection and Reporting System for our pilot projects and the @IMOHQ Mandatory Data Collection system (DCS)? Have a read of our Information Notice in the link goo.gl/Hcr1ou
#MTCCs #GMN #IMO

Visibility on MTCC Caribbean’s pilot projects on MTCC Caribbean’s Twitter Account
Visibility on MTCC Caribbean’s pilot projects on MTCC Caribbean’s YouTube Account
Visibility on MTCC Caribbean’s pilot projects via the use of the top three local daily newspapers in Trinidad and Tobago on the 24th June, 2018